A Database Publication

THE MICRO USER

Volume 7
Number 2
April 1989
£1.50

Top-selling guide to the BBC Micro, Master, Archimedes and Z88

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Getting more out of your BBC Micro

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National Curriculum and the BBC Micro

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Z88

Help in defining your own windows

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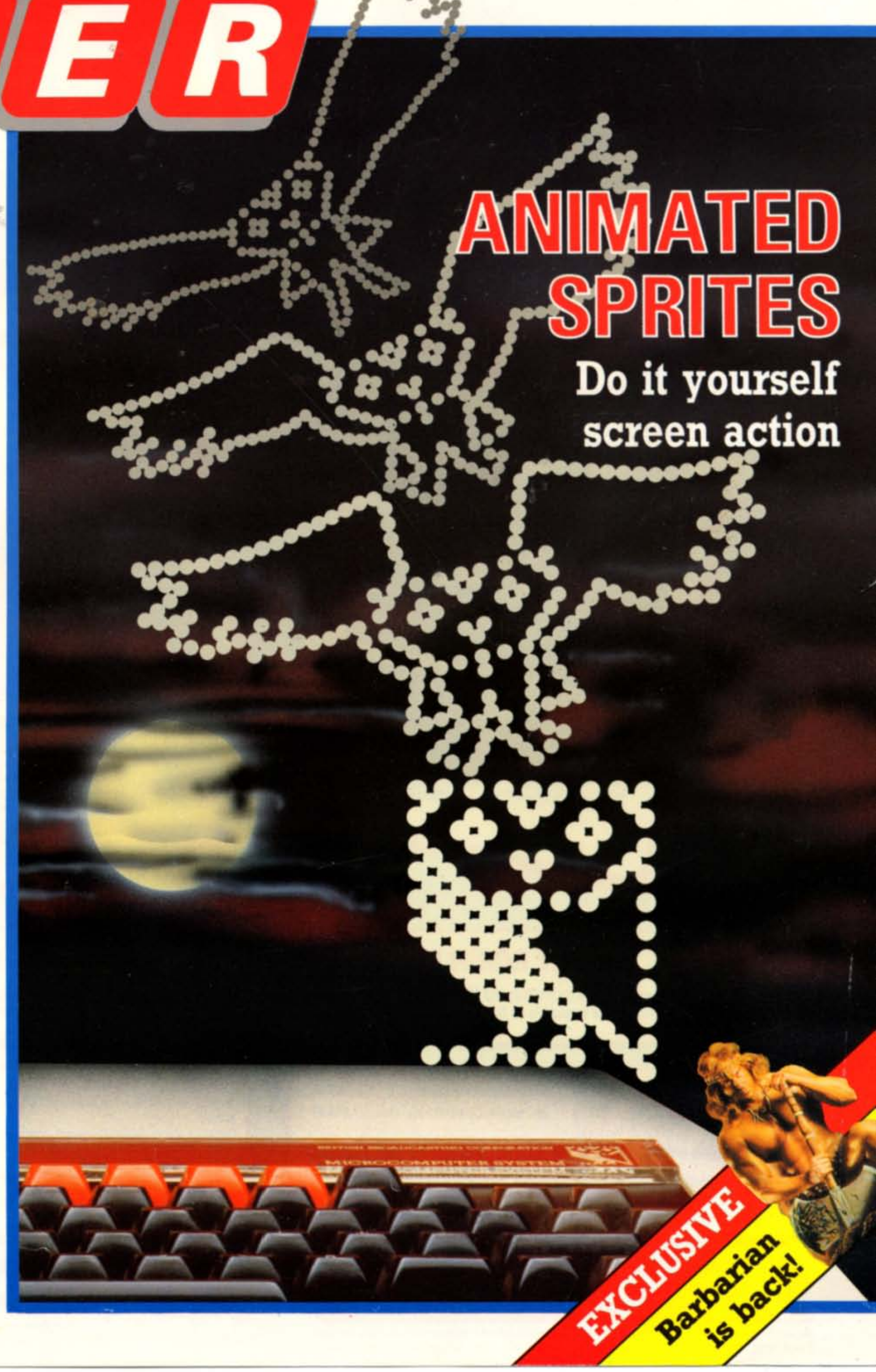

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EXCLUSIVE

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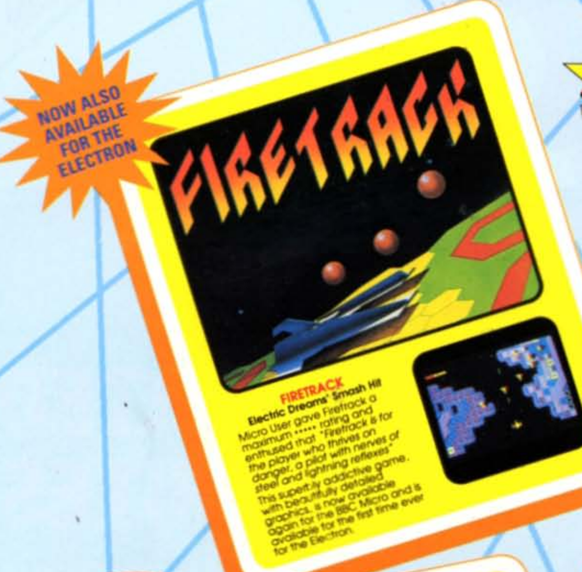
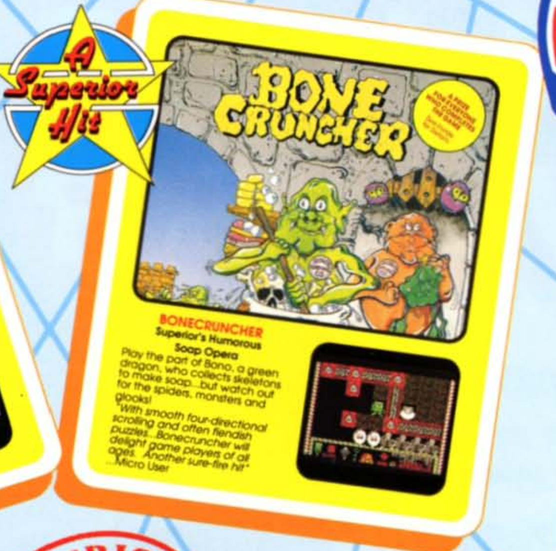
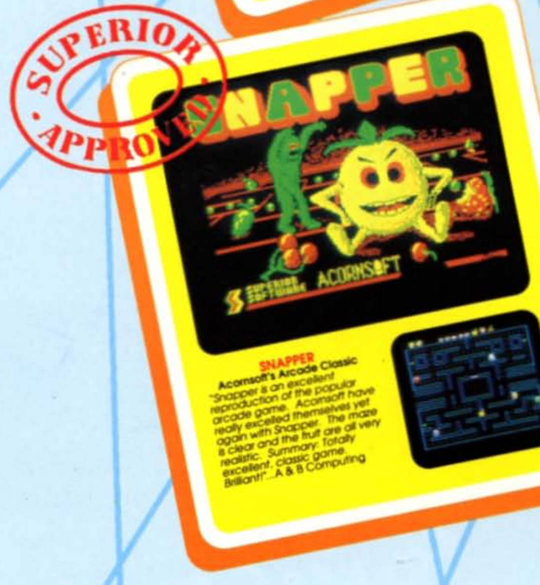
PLAY IT AGAIN SAM 7


NOW ALSO AVAILABLE FOR THE ELECTRON
FIRETRACK

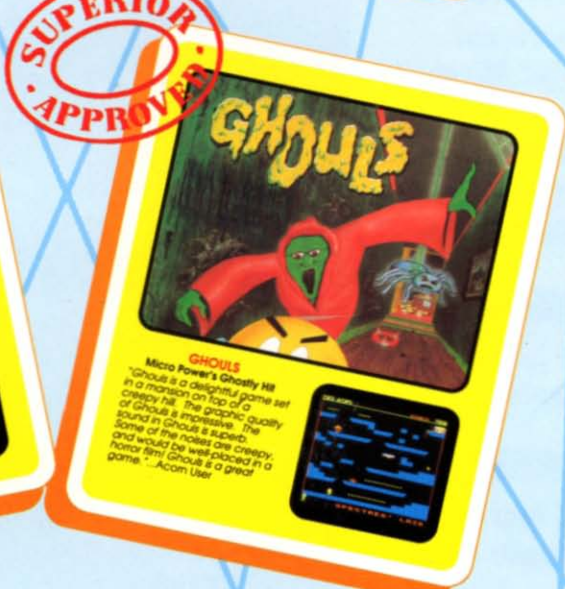
FIRETRACK
Electric Dreams' Smash Hit
Micro User gave Firetrack a maximum ***** rating and enthused that "Firetrack is for the player who thrives on danger, a pilot with nerves of steel and lightning reflexes". This superbly addictive game, with beautifully detailed graphics, is now available again for the BBC Micro and is available for the first time ever for the Electron.



BONECRUNCHER
Superior's Humorous Soap Opera
Play the part of Bono, a green dragon, who collects skeletons to make soap...but watch out for the spiders, monsters and glooks!
"With smooth four-directional scrolling and often fiendish puzzles...Bonecruncher will delight game players of all ages. Another sure-fire hit" ...Micro User



SNAPPER
Acornsoft's Arcade Classic
"Snapper is an excellent reproduction of the popular arcade game. Acornsoft have really excelled themselves yet again with Snapper. The maze is clear and the fruit are all very realistic. Summary: Totally excellent, classic game. Brilliant!"...A & B Computing



GHOULS
Micro Power's Ghostly Hit
"Ghouls is a delightful game set in a mansion on top of a creepy hill. The graphic quality of Ghouls is impressive. The sound in Ghouls is superb. Some of the noises are creepy, and would be well-placed in a horror film! Ghouls is a great game."...Acorn User

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The Micro User welcomes program listings and articles for publication. Material should be typed or computer-printed, and preferably double-spaced. Program listings should be accompanied by cassette tape or disc. Please enclose a stamped, self-addressed envelope, otherwise the return of material cannot be guaranteed. Contributions accepted for publication will be on an all-rights basis.

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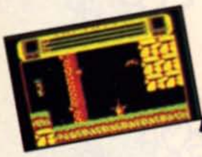

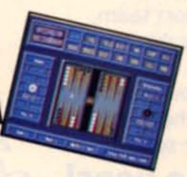

113 Software Quickies
We take a look at what two new Archimedes packages can to offer.

Cover story

Whether you're just starting out in graphics or an expert, this new series on screen animation has something for everyone. We'll take you through everything you need to know, from the basics of micro motion up to a full blown colour sprite routine. It starts on Page 21.

BARBARIAN II

BARBARIAN II
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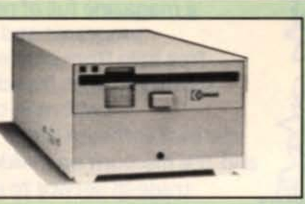
1
2
©1989 SUPERIOR
©1988 PALACE
CONVERSION BY PETER SCOTT

BARBARIAN·II
THE DUNGEON OF DRAX

Another blockbuster from Superior Software? Turn to Page 40 and find out what Hac Man has to say about this amazing new game by that master of the arcade adventure, Peter Scott.



A new concept in disc drives giving an incredible 10 mega-bytes of storage on a floppy disc. For the facts behind this breathrough for the Master, turn to Page 29.

MICRO USER CLASSIFIEDS

The best bargains in the world of the BBC Micro come from fellow readers of *The Micro User*. Turn to ***Page 122*** to find just what you're looking for – from cheap modems to complete computer systems.

✓ **For full details of how to use the Checksums, see the article on Page 48 of the February 1989 issue of *The Micro User*.**

✳ **The Type-it-in symbol indicates that the feature contains at least one full length listing for you to key in on your micro.**

NEXT MONTH

GO SLOW
Retarding the BBC Micro

CAPTIONS
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YAHTZEE
Traditional gameplay

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May issue on sale April 5

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M4

NEWS beat

Acorn's Unix flagship launched

ACORN'S new R140 Unix workstation is now on the market. With integrated multitasking, multi-user, graphics, windowing and networking capabilities, it falls in the £4,000 bracket.

Based on Acorn's 4 mips, 32 bit Risc processor the R140 retains full connectivity with standard products from other manufacturers.

Included in the price is a 12 month support package with on-site maintenance, plus telephone hotline assistance and diagnostics from Granada Microcare. Warranty and free software updates complete the package.

Available through distributor Hugh Symons (0202 745744) and appointed dealers, the R140 comprises 4Mb of ram, an internal 50Mb hard disc, a 3.5in 800k internal floppy disc and four expansion slots.

"We believe that the R140 range will satisfy the growing demand for affordable Unix from computer users in science and education as well as commerce, industry and administration", said David Slight, Acorn's Unix product manager.

"The R140 workstation provides not only powerful and versatile computing but also reliable and prompt support and long term commitment from the leading supplier of computers to the education and research communities".

The R140 performs very favourably when compared with the much pricier Sun and Apple Unix workstations. The standard Risc OS is also included and the hard disc can be partitioned to take both Unix and ADFS files.

For standalone operation without Ethernet interface card the price is £4,025. The workstation packaged with a standard monochrome monitor sells for £4,599.

ARC MONITOR SNAG

A MAJOR dealer has ceased to stock NEC Multisync II monitors after having seven returned by different customers in one day.

The dealer, who does not wish to be named, said customers complained of a broad line across the screen when using it with the Archimedes.

Previous monitors sold had not brought any complaints and customers using them with PCs had no problems.

John Hendon of NEC told *The Micro User* that this particular monitor will not support graphics modes 18 and 20 on the Archimedes and should not be bought by people wanting to use all the machine's graphics modes.

"I would have thought that the dealer would have realised this", he added.

Helping hand for robotic arm

INTELLIGENT Interfaces of Stratford-Upon-Avon has come to the help of polio victim Mike Topping (above) whose computerised robotic feeding arm for the disabled took first prize in The Micro User 1988 Innovation Awards.

Mike's prize was an Archimedes provided by Acorn but he discovered that to harness the micro to the feeding arm he needed an extra bit of equipment.

The Micro User *stepped in and a call to Andrew Ray at Intelligent brought the promise of a free 16 bit parallel I/O expansion card which provides two separate 16 bit input and output ports.*

Andrew has also promised Mike help and advice with any programming problems he may have. Andrew's brother Nicholas said: "We were very pleased to be able to help Mike put his invention into operation".

Mike said: "It's great, and very generous. Now that we can harness it to the Archimedes, it will give us another machine on which to run the robotic arm which has so far run on BBC B and Master".

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1081C	ISO Pascal	113.85	108.16
1082D	Fortran 77	113.85	108.16
1083B	Twin	33.35	31.68
1084D	Logistix	113.85	108.16
1086D	Prolog X	228.85	217.41
1087D	Lisp	228.85	217.41
0900B	PC Software Emulator	113.85	108.16

1st Word Plus

1st Word Plus is a mouse driven word processor which takes full advantage of the user-orientated desktop features of the Archimedes system. It is suitable for both absolute beginners in word processing and experienced users of other word processors.

Stock Code 1088D

Members Price £87.34 *Normal Price £91.94*

1088D	1st Word Plus	91.94	87.34
0902D	ARM Assembler Package	228.85	217.41

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0904B	EMR Creations Disc	19.95	18.95
0948C	EMR Studio 24	99.00	94.05
0905E	Logotron Logo	69.00	65.55
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0917B	Pipedream Spellcheck	49.45	46.98
0908C	Flying Start II Database	99.95	94.95
0909B	Archeffect	24.99	23.74
0910B	ArcTFS	29.95	28.45
0911B	AutoSketch	91.54	86.96
0912B	ARC-PCB	99.95	94.95
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*** Requires System Delta Plus**

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0805D	CC ROM Podule	56.35	53.53
0806B	Battery Backup for above	11.50	10.93
0803B	Armadillo Sound Sampler	126.50	120.18
0825C	IEEE488 Podule	326.50	310.17
0802C	Chromalock Podule	339.25	322.29
0808C	Watford Video Digitiser	286.35	272.03

Artisan

The Artisan graphics package for the Archimedes system runs in Mode 12 and makes full use of windows, icons and the mouse, as well as using standard files for all input and output. Standard screens and sprites are interchangeable with other programs using the Acorn conventions. Artisan uses the power of the Archimedes range to provide you with a program that is easy to use.

Stock Code 1095C

Members Price £35.96 *Normal Price £39.95*

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0266C	0.5Mb RAM (305 only)	171.35	162.78
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*** Requires Podule Backplane**

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NEWS beat

BATTLE IS JOINED

THE general commanding a tank corps has the job of capturing enemy headquarters and annihilating all enemy forces. That is the scenario for Tankattack, the latest game from CDS Software (0302 321134).

Like its predecessor, Brian Clough's Football Fortunes, Tankattack is built around a board and is for two, three or four players.

Price £12.99 cassette, £14.99 disc.

Arc gets weaving

WEAVING its way into textile design, the Archimedes has now been harnessed to a brand leading package from Harris Looms (0233 622684).

"The Archimedes will allow the designer to make swifter changes of colour, weave and a vast increase in options come with the package", said Harris Looms' managing director, Bill Emmerich.

"The speed of Archimedes works at the pace of textile designers' thought processes and new programs will bring all operations on to one screen".

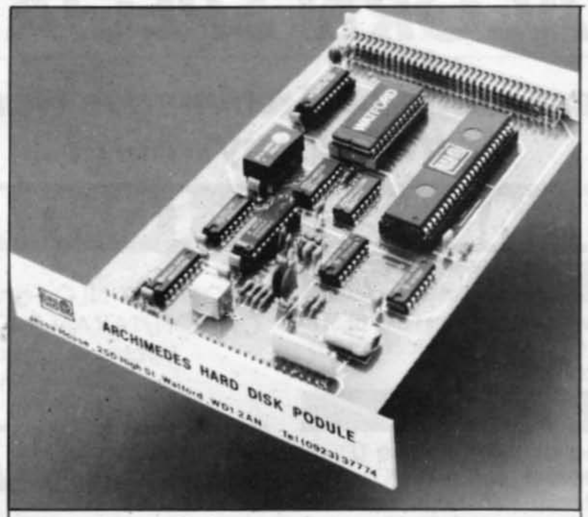
The new Mark III Controller package matches up to the latest Harris programs, and more sophisticated patterns are possible by the inclusion of an LCD display.

Harris hopes to have its new package on the market this month at a price around £1,000.

Expansion card suite

A SUITE of libraries for its Archimedes IEEE488 Interface expansion card has been launched by Intelligent Interfaces (0789 415875).

They provide procedures for Fortran, ISO pascal and Ansi C, and each contains example programs. Price £95 each.



WATFORD Electronics (0923 37774) has produced the Arch-HD20 Winchester disc drive and expansion card.

This latest upgrade for the Archimedes is claimed to give high performance at low cost, and includes the controlling expansion card. Price: £379.

System Delta Plus updated

POPULAR Archimedes database System DeltaPlus will now operate with RiscOS which is due out in April, says Minerva Software (0392 437756).

"We've taken advantage of this new release to update many features and to re-write the manual supplied with the package", said a spokesman.

"The System DeltaPlus Version II manual contains additional information including a new overview section for a quick look at the program.

"Existing DeltaPlus users need not worry as a disc will be provided to enable them to run the current version with RiscOS". System DeltaPlus Version II will cost £79.95.

History, sci-fi go on line

TWO new categories on MicroLink underline the wide range of activities enjoyed by users.

Science fiction buffs and local historians now have sections devoted to their interests.

Bristol historian Mike Gardener, publisher of Exploring Local History magazine, has helped to set up MicroLink's new local history category.

"There is a vast and nationwide interest in this subject but so far it has been fragmented", he said. "Everyone wants to get into a wider field but there has been no way for individuals or societies to get together for discussion.

"MicroLink can solve the problem by providing a platform or forum for this massive subject where subscribers can exchange ideas, seek help, expound their own theories or challenge other people's ideas. The possibilities are endless".

The local history category is aimed at the full range of historians from interested amateurs to professionals and will even give pointers on how to start becoming a local historian.

Timescale is equally wide with subjects ranging from ancient history to present day.

Genealogy, family history, the origin of place names, re-enactment of battles, archeological connections and oral history from elderly residents are just some of the subjects covered.

Short book reviews and articles are put on line and Mike hopes to start up some lively discussions on controversial topics. Freelance history writers can be called in to provide a help line for subscribers who may have problems with a particular topic.

"The most exciting thing is that, through MicroLink, local historians can now communicate instantly with each other", he added.

● Meanwhile, a photographer from Stirling, Colin Campbell is helping to organise MicroLink's new science fiction category.

Basing the content on the "fanzine" publications that are the most popular journals for sci-fi fans he reviews books, movies and also hopes to deal with television programmes. Watch out Dr.Who, Blakes' 7 and Star Trek.

"The reviews are not always the sort you see in the Sunday newspapers", he said. "There is quite a lot of slagging off".

Subscribers can test their sci-fi knowledge with regular trivia quizzes for which Colin donates review copies of books as prizes. The new category also promotes the exchange of sci-fi ideas.

"The support has been quite remarkable", he said.

"Science fiction is very easily pigeon-holed: It is a very neat thing to put on a bulletin board – ideal for MicroLink".

For details on how to subscribe to MicroLink see Page 82.

CJE micro's

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NEWS *beat*

Acorn's choice

ACORN Computers has announced two new marketing appointments. Warwick Hirst has been made industry marketing manager and Frank Burdett is the company's adviser on higher education.

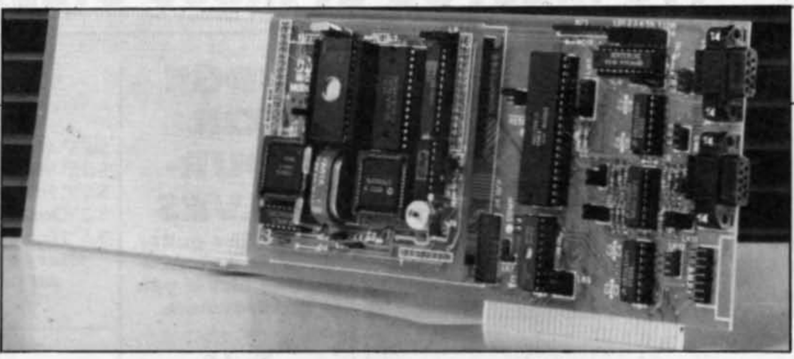
Hirst comes to Acorn from Torch Computers and will be using his international marketing experience to develop new and existing markets for the Acorn range.

Warwick Hirst, new industry marketing manager for Acorn

Before working at Torch, he was with Pitney Bowes, responsible for introducing electronic sales and accounting systems into 16 countries. He has also worked for Unilever and Twinlock and has an MA from Oxford.

Burdett joins Acorn from Bath College of Higher Education where he was a lecturer. When he studied for his PhD at Manchester University, part of his thesis was computers for education. He also has mainframe and micro computing experience in higher education.

Frank Burdett, Acorn's higher educational adviser



New BBC Micro – IBM link

THE latest piece of hardware from Cambridge Microprocessor Systems (0954 51122) makes the IBM compatible with the BBC Micro.

MicroBeeb has been developed to reside inside an IBM or compatible PC. The processor, with real time event drive language, can be programmed by the IBM user and then run independently of application software being used by the IBM.

It comes with multiple, fully programmable serial interfaces, industrial spec communications network and both digital input/output and analogue interfaces.

Typical applications include the collection of real time data from remote sensors or devices and direct input into a Lotus spreadsheet.

GLASNOST BOOST FOR BBC MICRO

THE BBC Micro is alive and well and going from strength to strength in Russia. That is the message from a Cheshire-based company which specialises in selling to the Eastern bloc.

Putting micros into Russia is a precise art which is closely linked with the economic development of the country. It is governed by politics and even by such factors as the electricity supply.

Learning the system and promoting confidence in the market is a slow job, but it is one that has been well worth doing for partners Bob Graystock and David Springle.

After living in Russia for five years, they started 3SL Overseas six years ago.

With current moves towards more cooperation with the West, their job is ever changing, but one thing remains constant – the popularity of the BBC Micro range in Russian education and industry.

3SL is now the official representative of Acorn in Eastern Europe and has sold many micros into education and industry in Russia. The Russians are working towards their goal of at least one machine in every school and it is a target with which 3SL is giving every assistance.

"We decided at the outset to develop a dual language system which was user-friendly, which would toggle between languages with one key press and would work with the existing View family as well as being usable in their home grown programs", said Bob.

"Our system is network compatible and works on the whole range of Acorn products. We provide three keyboard presentations – Cyrillic, qwerty and the accepted Soviet standard version of a Latin keyboard".

"We have not attempted to market the system in the UK since we were not sure how much interest there was.

"However, after the visit to the USSR by Kenneth Baker, interest in things Soviet are on the increase. Just before Christmas, we hosted a delegation from the Soviet Ministry of Education.

"We visited many educational establishments and they were most impressed by what they saw of the use of micros in British education".

Not only are Acorn computers being used right the way across the Russian educational system but they are employed for control purposes in Russian factories.

Political changes in Russia have been mirrored in 3SL's dealings there. "In the past, purchase of computers was made through buying agencies", said David Springle. "Now the buyers are allowed to get much closer to you. It is a completely different ball game".

The 3SL system is also available in Latvian, Ukranian, Polish and Bulgarian with other languages by arrangement. The UK cost is £60.

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NEWS *beat*

Archimedes keeps tabs on power plant

THE power of the Archimedes has been harnessed to even greater levels by a new application. It is being used by engineers who carry out regular calibration checks and adjustments to the turbine monitoring system at the Didcot power station.

Developed by Farnham-based A.C.I.C., the system used by the Central Electricity Generating Board links Archimedes via RS423 current loop adaptors to the monitoring system's analogue-to-digital converters.

This means engineers can carry out on-site calibration anywhere on the plant with less chance of faults.

MORE FOR EDUCATION

FIVE new education programs for the BBC Micro will be released this year by Sherston Software (0666 840433).

Due out in April are graphic adventure The Microbugs, language and maths program Teddy Bears' Picnic, and animated story Dreamtime.

Scheduled for October are news service simulation Teletype and database package Book Store.

Your own newspaper

THE library of British Telecom Educational Software for the BBC Micro will be further increased soon by a journalistic simulation called Newsnet.

The program will introduce youngsters to desktop publishing, providing them with the tools to produce a newspaper.

"We had hoped to have Newsnet available at Easter, but delays in development have caused the release date to be put back", said a spokesman for BTES (01-356 5685).

Rewards for success: (left to right) Adrian Calcroft, Harvey Coleman, Nazir Jessa and Alan Edwards at the gold plaques presentation

GOLDEN SUCCESS FOR TOP ACORN DEALERS

THREE of Acorn's top dealers will be soaking up the sun as their reward for good market results. At the first 1989 meeting of Acorn's Premier Dealer League in London's Kensington Park Hotel they heard they had each won £2,000 to be set against a holiday of their choice.

Watford Electronics MD Nazir Jessa collected the prize for selling most Archimedes machines from September to December 1988.

Adrian Calcroft of Beebug received the award for converting most leads from advertising and exhibitions into machines sold, and Alan Edwards, represented Berkshire-based MAV, gained the biggest increase in Acorn product turnover in the second half of l988 over the first half.

Acorn Computers' MD Harvey Coleman presented them with their holiday vouchers together with an engraved gold-plated trophy.

Acorn's Premier Dealer League was established in l988 and meets three times a year for informal exchange of views. Members are the 25 dealers with the biggest turnover of Acorn products.

Scrolling around on Z88

LATEST development for the Z88 is a VT100 emulator designed to give the portable the facility to scroll round a full 25 line screen. Peter Wharton of Ranger Computers (0604 791064) said the company was still finalising price and release dates. Ranger has been appointed by Cambridge Computer to develop the corporate market for the Z88.

Demons invade Arc

LATEST addition the range of Archimedes entertainment programs from Minerva Software (0392 437756) is Thundermonk.

The game has a variety of intriguing paths to the ultimate goal of recapturing the monastery from the grip of evil demons. You have to lead the Lonesome Monk's army on a quest through the labyrinths to and recover all the great treasures hidden in the monastery.

This involves battling with the demons for the golden keys with which you unlock the doors of destiny and progress to higher levels.

Price £14.95.

Accent on energy

A BBC Micro simulation of power station operations has been released by The Electricity Council (01-834 2333). Power Control is designed for use with GCSE and A-level syllabuses and covers the topics of energy studies and power industries.

The package includes software, worksheets and suggested topics for investigation. The software examines each of the major types of UK power station – coal, oil, nuclear and pumped storage.

A detailed tutorial is provided for each type of station, and interactive models are provided so that students can set up and monitor experiments. Price £8.

NEWS beat

MATHS ON THE ARC

AN Archimedes version of the popular BBC Micro maths teaching package Numerator is to be produced by Logotron (0223 323656).

"This version of Numerator will form part of our new range of software for high power educational micros – which will include an Archimedes version of Logo", said a Logotron spokesman.

Check on the card

SOME purchasers of Repton Infinity and The Last Ninja have had a rough deal. Superior Software (0532 459453) says the two games should include a yellow postage paid card so players can request copies of the official clues and maps which can prove invaluable to completing the games.

Some copies have gone out without these cards and anyone without one should write to Superior at Regent House, Skinner Lane, Leeds LS7 1AX stating where they bought their game.

Getting to know the Risc

A NEW family data manual is now available for the Acorn-designed Arm Risc chip set. It is the result of a contract between publishers Prentice Hall and VLSI Technology, whose tools were used to design the chip set.

Jim Farrell, technical communications manager for VLSI said: "The Arm technology has enormous potential, particularly for embedded controller applications. The new manual will help establish it as an industry standard".

The manual will be distributed to colleges for course work and will also sell through book stores and other commercial outlets.

Beeb backs Stuart

TELEVISION personality Stuart Hall is known nationally as the jovial host of It's a Knockout, but viewers in the North West are better acquainted with him as one of the regular presenters of the regional news programme North West Tonight.

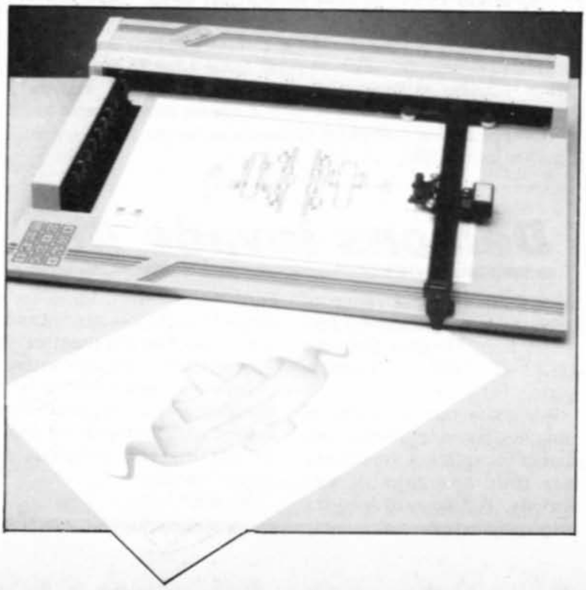
Stuart, his co-presenters and the reporting staff in the BBC's North West newsroom rely heavily on background information and to give quick access to this they have a Beeb at the Beeb.

Originally brought into the newsroom to help with election coverage, their BBC B has now become an extremely useful back-up to the wonders of modern television technology at the Manchester studios.

Professional plotter

LINEAR Graphics (0686 29292) has brought out the Plotmate Plus XY-500, a high performance addition to its range of graphic plotters.

A professional model of the Plotmate series, the XY-500 runs at 35cms a second and has automatic selection of 10 pens as standard. It retains all compatibility with BBC Micro graphic VDU commands. Price: £920.



RIBBON REVIVER

CASPELL Computer Services (0202 666155) has a remedy for restoring faded fabric printer ribbons.

Its Refresh aerosol contains a mixture of inks, oils and organo-silicon compounds to be sprayed direct on to the ribbon.

Price: £8.95 available only by mail order from Caspell at 43 Emerson Road, Poole, Dorset, BH15 1QS.

Accent on speed

ABOUT to make its debut on the games scene is Clares Micro Supplies (0606 48511). The firm's first entertainment software offering is a compilation of three arcade favourites – Zarkon Invasion, Mazey Man and Bounce-a-Ball.

"The games have been made even better through using the power of the Archimedes", said a Clares spokesman. "All are super smooth, even when the going gets tough.

"Bounce-a-Ball, the high tech version of Brick-Out, has lots of different bricks and 20 levels". Price £14.95.

COFFEE COVER

COMPLETE keyboard protection from liquids, dust and dirt is promised by the latest BBC Micro product from Mektronic (061-798 0803).

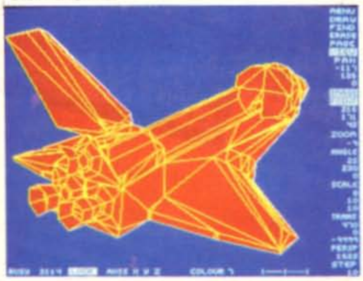
Keyboard Protector is made from clear, flexible pvc and fits snugly over the BBC Micro.

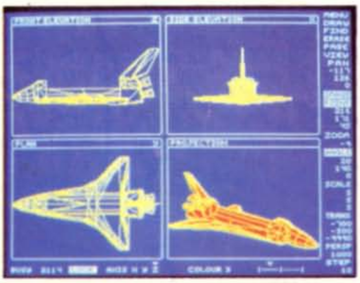
"Moulded to fit every key, it protects against dust, ash, grime, chemicals, grease and spills – yet still allows free and easy typing", says Mektronic boss Brian Benster. Price £12.

SILICON VISION

SOFTWARE FOR THE ARCHIMEDES & BBC

SolidCAD





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£49.95 (ARC or BBC B/B+/Master), New

REALTIME SOLIDS MODELLER

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The ultimate printer driver which takes advantage of the highest resolution capability of ordinary Epson compatible printers to provide 1920 × 1024 resolution. Images can also be scaled, positioned and previewed before printing. Fully compatible with SolidCAD, Realtime Graphics Language, Gate-Array design system & 3D CAD/Animation system. Your own graphics programs or other CAD packages can be made compatible with Super-Dump by the addition of a few simple commands. An example program is included in the package.

£15.95 (BBC B/B+/Master), £24.95 (ARC) New

Presentation System

The package provides an interactive environment to create, edit and play-back computer controlled presentations for lectures and demonstrations. Also handles graph plotting for polynomials & user-defined functions which can be incorporated within the presentations.

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All Archimedes software run in native mode on A305 – A440

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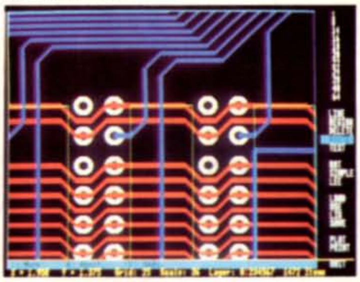

The ultimate PCB design system developed specifically for the Archimedes with a specification that cannot be matched. Includes Automatic routing, Rats-nesting, 8 layers, Surface mount capability, 0.001" resolution, 32" × 32" maximum board size, On-line Help, Fast Zoom/Pan/Redraw, Text & Silkscreen facility, Variable Line/Pad/Text/Grid sizes, Part Libraries, Block Move/Copy/Rotate/Mirror/Erase options, and up to 300,000 components.

For hardcopy, the system supports the industry standard HP-GL, GRAPHTEC, PLOTMATE plotters and printers at their highest resolutions. Also provides automatic drilling information with extensive support from PCB manufacturers for final layout and production, optional 1 year telephone Hotline support (£100) and software maintenance service (£75) is also available.

£195.00 (ARC) New

Risc BASIC

The first true BASIC V syntax compiler which will convert your programs into supercharged Risc code for turbo performance leaving the competition standing. Features include Relocatable modules, full cross references, Double precision floating point & Integer support, in-line assembly, Window-based or command line compilation environment, standalone code generator, object code optimiser, full array manipulation and dimensions support, multiple exit structures & full runtime error handler.

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RiscFORTH

A new 32-bit implementation of the FORTH-83 standard, designed to take full advantage of the ARM architecture. Features include Multi-tasking, Optimising compiler, built-in ARM assembler with floating point mnemonics, built-in Full screen Editor, File system interface, OS calls support, Floating point & Integer maths, WIMP support, Single-step debugger, Shadow screen for documentation, Block manipulation, Dictionary & Vocabulary display, Call finding and a standalone code generator.

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MINERVA SOFTWARE FOR THE

Archimedes

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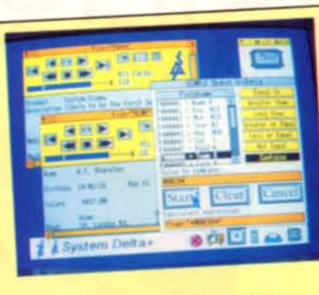
SYSTEM DELTA

System Delta is the most comprehensive database available yet. It's so simple to operate that it has already become the standard in educational fields. It is very professional and pleasing in its presentation, making full use of the genuine Archimedes WIMP environment. It can handle vast amounts of data in the office, school or home, with its capacity of 2.14 billion records and 16 million fields. Its multiple 'key fields' allow any record to be found in 1 sec. even in a file of 20,000 records.

It maximises on the Archimedes' speed and has unique multi-tasking allowing an operation to continue on one file whilst performing a search or print on another. Easy file creation using free format screens with eight data types. Multiple display, print and report formats with each file including a user defined label facility. Three methods of search from simple option selection to in-depth multiple criteria, multiple fields or results of formulae. Comprehensive maths facilities allow results to be placed in other fields. Fast sort by any criteria on any number of fields. Transfer fields from one database to another. Imports data from other databases, exports data to Gamma and Sigma. Absolutely no programming required – but if you wish to program or customise then of course, we provide a full set of commands for you.



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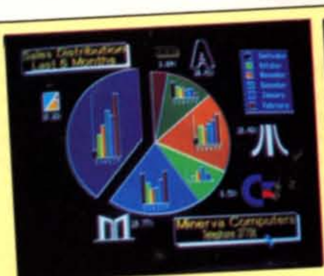
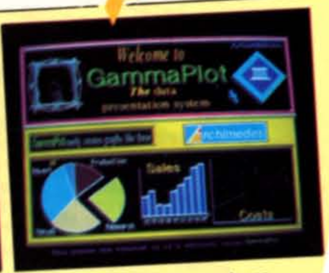
GAMMA PLOT





Seeing is believing! GammaPlot is an extensive chart/graph plotting program with a full art package included. It allows even a novice to produce stunning charts and drawings on one screen. Several charts may be placed on one sheet, in any position with text or drawings to make the data easily understood.

GammaPlot supports six main graph and chart types of line, scatter, pie, histogram, 3D histogram and text-only charts. Segments may be highlighted or percentages, values and labels switched on. Statistics are also available. Choose from the text styles supplied or any of the native Archimedes 'pretty fonts' or even define your own, and any of these can be enlarged or reduced. Various shapes, patterns and borders are supplied with a full 256 colour range. Full zoom facility. Various pen types are provided to draw pictures or add signatures. Import digitised pictures or company logos. Print facilities include colour output. Data entry is via the keyboard or any Delta, Gamma or Sigma file.

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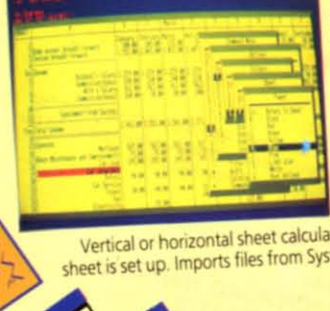
SIGMA SHEET



Probably the largest and fastest spreadsheet on any small business micro! The massive sheet size is 1000 columns by 16000 rows. Definable colours, spacing, and widths. Various cell formats including justification, up to 17 decimal places, preceding currency sign, bracketed or coloured negatives, percentage, exponential. Select to display the formulae instead of calculated sheet for really fast and easy sheet set up. Cell references may be alphanumeric or by label for ease of use, eg. A2 or "Jan" sales". Automatic relative or absolute reference adjustment while replicating. Simple yet extensive maths allowing calculations based upon references to other cells. Over 30 maths/statistical functions including SUM, AVG, COUNT, MAX, SIN, LOG, SQR, etc. Full date and time handling. Makes use of Maths co-processor, if fitted. Vertical or horizontal sheet calculation or intelligent mode which always gets it right no matter how the sheet is set up. Imports files from System Delta and most spreadsheets. Exports data to Gamma Range.

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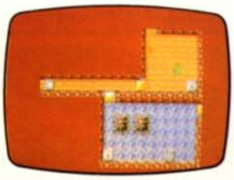
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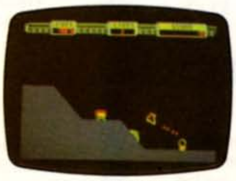
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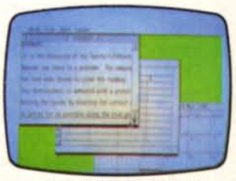
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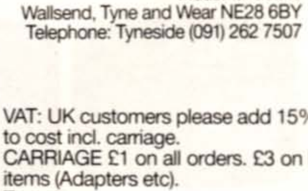

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The basics of movement

Eric Crisp begins a new series on producing animation

WITH all the marvellous games now available for the BBC Micro, animation is often taken for granted. The elaborate sprites used in many arcade style games look incredibly clever to the uninitiated, but in fact they are produced using essentially simple basic animation techniques. In this series I'll show you how it is done.

The dictionary definition of animation is producing the appearance of movement by the use of a quick succession of gradually changing drawings. Cartoon films are made in this way – originally by artists painstakingly drawing each frame by hand but now increasingly with the aid of computer graphics.

You may have seen or even made a crude animated cartoon by drawing an object, such as a ball, on the corners of successive pages of a note pad or you may have bought a flicker-book. With the ball in a slightly different position on each page, when the corners are flicked through the ball appears to bounce.

Although the animation seen in arcade style games may seem a far cry from this its production involves just a few elaborations on the basic technique. First let's explore how the moving ball is created.

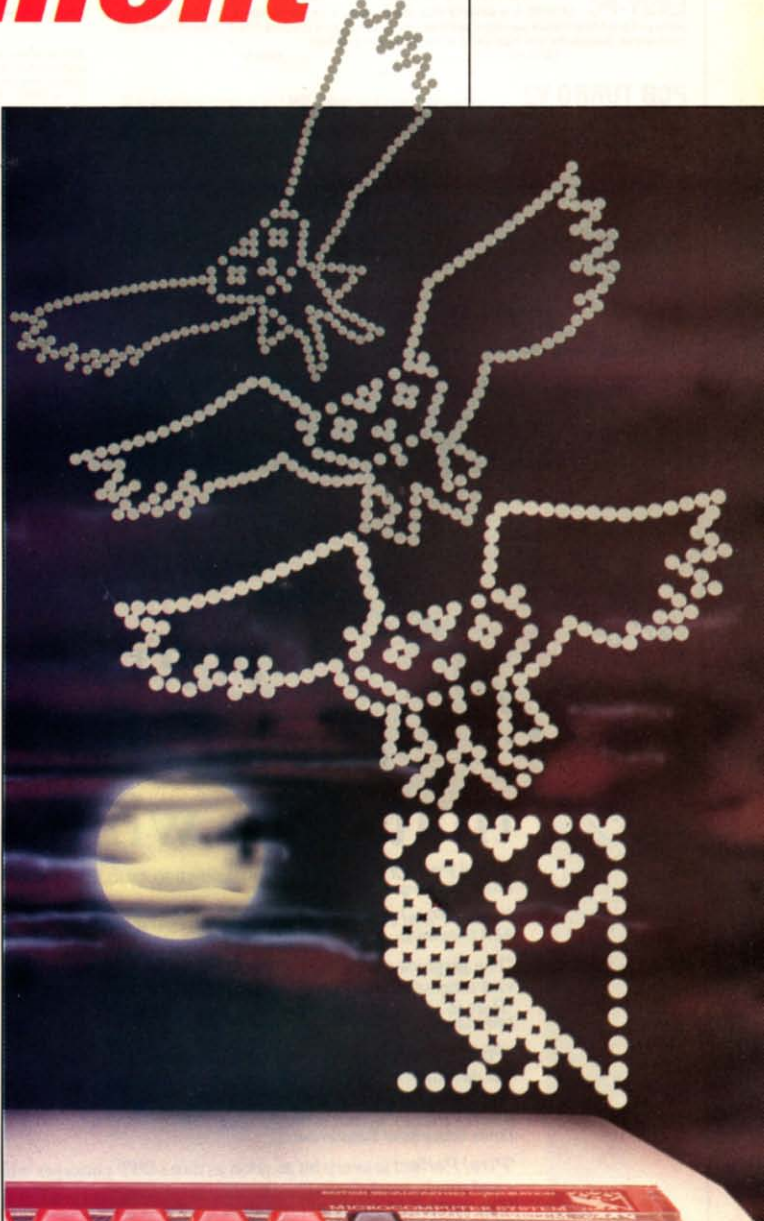
The notepad technique can be mimicked on the micro in Basic by drawing an O in one position then, a short time later, clearing the screen – the next page or frame – and printing it somewhere else and so on, as shown in this program:

```
10 MODE 1:VDU 23,1,0;0;0;0;
20 FOR I%=1 TO 30
30 CLS:PRINT TAB(I%,20)"O"
40 FOR J%=1 TO 500:NEXT
50 NEXT
```

Line 10 turns the cursor off after selecting screen Mode 1 and lines 20 and 50 allow for 30 pages. The ball is drawn on a clean page one character to the right of the previous position at line 30, and there's a short delay in line 40 to control the animation speed.

This is very crude, in that it it flickers and jerks, a situation which can be improved by using more frames or pages to cover the same distance. If twice as many frames are used the ball's position in each needs to be half a character to the right of its previous position rather than a whole character size. To do this we draw the ball at the

Turn to Page 23 ▶



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'PCB auto-route is remarkable. No similar software comes near the price.'–ACORN USER, Aug. '88.

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To order or for more information on the best BBC desk top publishing system available write to AVP, School Hill Centre, Chepstow, Gwent NP6 5PH. Telephone 0291 625439

VISA

◀ From Page 21

graphics cursor instead of the text cursor, like this:

```
10 MODE 1:VDU 23,1,0;0;0;0;
20 FOR I%=1 TO 60
25 CLS:VDU5
30 MOVE I%*16,380:PRINT"O"
35 VDU4
40 FOR J%=1 TO 50:NEXT
50 NEXT
```

Here we draw a few more frames using VDU5 which allows text to be printed at the graphics cursor – VDU4 switches back to writing at the text cursor. We also chop the time delay to ensure that the frames are displayed faster. There is a bug in VDU4 which switches the flashing cursor back on even if it was off before.

The animation will now be less jerky. Further smoothness can be obtained by reducing the factor by which *I%* is multiplied on line 30 so that the gap between successive positions is reduced still further. Try changing this to eight – you'll notice the ball moves more slowly and not so far as a consequence. There's little point in reducing it below four, since that is the size of one screen pixel in Mode 1.

```
10 MODE 1:VDU 23,1,0;0;0;0;
15 K%=0:VDU5
20 FOR I%=1 TO 60
25 GCOL0,0:MOVE K%*8,380:PRINT"O"
30 GCOL0,3:MOVE I%*8,380:PRINT"O"
40 FOR J%=1 TO 50:NEXT
45 K%=I%
50 NEXT
55 VDU4
```

Program I

Now because the animation is smoother the flickering becomes more noticeable. The main reason for this is that the whole screen is cleared before drawing the ball in its new position, so there's a noticeable period during which there is no ball to be seen. It would be more efficient to clear only that part of the screen where the ball is, and so reduce the time during which there is no ball.

The ball can be rubbed out by drawing one on top of itself in the background colour, as demonstrated in Program I.

This time we set up a variable *K%* which will hold the last position of the ball and switch to cursor printing. The first thing we do in the loop is rub out the last ball by drawing over it in the background colour – there isn't one, initially but this doesn't matter here.

Then we switch to foreground colour, move to the new ball position using *I%*, and draw it. Then we wait a moment before remembering the new position and looping round to do it again.

The animation is not only less flickery, but is now faster thanks to improved efficiency. However, a new phenomenon has occurred – the apparent splitting of the ball between its new and old position on occasions. To understand what is happening you need a quick lesson in the workings of the TV or monitor screen, so take a look at the accompanying panel.

This problem can be overcome by using **FX19*, which makes the micro wait until the next screen refresh begins. Finding the best place for this instruction is usually a matter of trial and error, as it is all a question of timing which depends on the program and can depend on your particular system. Inserting the line:

```
35 *FX19
```

should solve the split ball problem in most cases and eliminate flicker, or you could try it at line 24 – even split up line 25 and put it just before the PRINT command. Remember that because it is a star command it must be the last thing on a line.

TEXT AND GRAPHICS CURSORS

When you switch on your BBC Micro and enter text it is displayed at the text cursor. If you are using Mode 1 a letter fits into one of the 40x32 positions on the display and the screen scrolls when the bottom right-hand corner is reached.

If you enter VDU5, text comes under the control of graphics commands and can be positioned more accurately on the screen. Use the MOVE command to set the cursor anywhere in the 1280 by 1024 graphics grid then PRINT your text, and that's where it will appear.

You can return to the text cursor using VDU4.

Now try varying the delay on line 40. This will not only change the speed of the animation but will alter the time between the *FX19 and the next drawing of the ball. For instance, change line 40 to:

```
40 FOR J%=1 TO 25:NEXT
```

This should cause the ball to be split all the time. Also try placing the *FX19 elsewhere to see the effect.

You should now have a ball smoothly moving across your screen. Not very impressive, yet it is a start. The next step is to get it to move over a background, as is the case with most arcade games. Make the background simple, say red with a large yellow triangle. Try adding this line to your program:

REFRESHING CHANGES

The picture on the screen is completely redisplayed – refreshed – once every 50th of a second. Each row of pixels is displayed in turn starting from the top and ending at the bottom. If the new picture is the same as the old one, our eyes usually perceive it to be steady – like a photograph. If the new picture is different, we see an instantaneous change.

However, if it is changed while the screen is being redisplayed, part will be the old picture and part the new, hence the splitting ball or possibly two at once or even none at all.

If we know when the screen refresh starts we can choose the time when we change the picture.

```
12 COLOUR 129:CLS:GCOL 0,2:MOVE 0,100:MOVE 60
0,800:PLOT 85,1200,100
```

Run the program and see what happens, you should find a problem – which we'll solve next month. Also covered will be the techniques needed to allow objects to change shape and the introduction of sprites.

CAST your mind back to the day you unpacked your first dot matrix printer – the excitement of plugging it in, translating the manual into English and sorting out the DIP switches and FX commands. Then there was the thrill of all those escape codes with their promise of an endless variety of print styles. Remember, too, how often you just printed out in standard draft type because it was simple and quick – but how boring.

Over the years numerous programs have been written to improve the variety and quality of output from 9 pin printers. Two of the most recent, reviewed here, will add to the proliferation of almost professional looking home-produced posters, leaflets and newsletters.

Get more from your printer

Bruce Goatly examines two pretty print packages

Product: The Publisher
Price: £46.00
Supplier: Permanent Memory Systems, 38 Mount Cameron Drive, St Leonards, East Kilbride G74 2ES.
Tel: 03552 32796

THIS foam-wrapped package contains a 64k pal-prom, a comprehensive and well-organised manual, a booklet showing the 74 fonts now available, a utilities disc and a keystrip. The software will work on a model B, B+, Master or Compact and requires an Epson-compatible printer, preferably capable of quad density graphics.

Although advertised as a desktop publishing system, it is not strictly that, being text-based rather than graphics-based. However, it does have two distinctive and novel features – it works from within your word processor or even from Basic, and it allows you to preview your printout on screen, thus saving valuable paper, ribbons and time.

In principle it is quite simple to use – you simply insert into your text a variety of easily remembered escape codes, rather like those you would use for controlling your printer's facilities, and when you output the text the codes are intercepted and used to alter the printing style. If you have Wordwise, Wordwise Plus or Inter-Word you can use embedded commands to specify the codes directly. With View you must first load the printer driver provided and sandwich the codes between Highlight 1 and Highlight 2.

“Numerous programs have been written over years to improve the output from 9 pin printers”

The possibilities available with the codes include multi-font, multi-sized text either centred or with left, right or block justification, emphasised type, a choice of background patterns and underline styles, and several designs of boxes and galley lines. These last are the vertical lines between columns in multi-column printing. Although the software will not itself produce multi-column output directly, galley lines can aid paste-up.

In fact the range of options is so large – see Figure I – that to stop you losing your way in a maze of codes there is a special option called macros, which may be a familiar concept if you use View. This effectively allows you to program a sequence of codes that you may wish to use more than once and call them all together with a single one. Up to 10 macros can be set up at one time and stored on disc for use in other documents.

Besides the escape codes, The Publisher also offers a set of star commands which enable or disable certain effects. For example, on a model B or B+ the software claims workspace which raises PAGE by 256 bytes. As this may cause problems with other programs, there is a command to deactivate the rom and reclaim the memory.

Others are listed in Figure II, the most used likely to be *PREVIEW, *DRAFT and *NTQ which control where the output will be directed – screen or printer – and the print quality. The *PREVIEW command is WYSIPWWYG – *what you see is pretty well what you get* – and the high resolution mode, in a special interlaced sync and video display, is truly impressive. The highest print quality is selected by *NTQ Q and the fastest draft by *DRAFT Q, which is somewhat confusing at first.

The program rom contains 16 fonts, instantly accessible for printing. Many are available on disc, or you can design your own – a lengthy process – with the font designer on the utilities disc. Up to eight can be worked on simultaneously, allowing transfer of characters between fonts, and the designer supports a range of input devices.

Disc-based fonts need to be converted to rom image form – one 16k rom can hold four fonts – and a program is provided to do this. If you have no sideways ram or access to an eprom programmer, PMS will turn your rom images into ready-to-use customised font extension roms at a reasonable price. PMS also has a trade-in service for its NTQ rom, a forerunner of The Publisher.

The Publisher is fairly easy to get the hang of, is very versatile and remarkably powerful for a text-based system. A few features took a little getting used to, like the need to distinguish between the number of characters on a line – specified by the word-processor's own commands – as distinct from the formatting of that text on a line – the left and right margins – defined by The Publisher's codes.

Some slight puzzles are also posed by trying to

Turn to Page 26 ▶

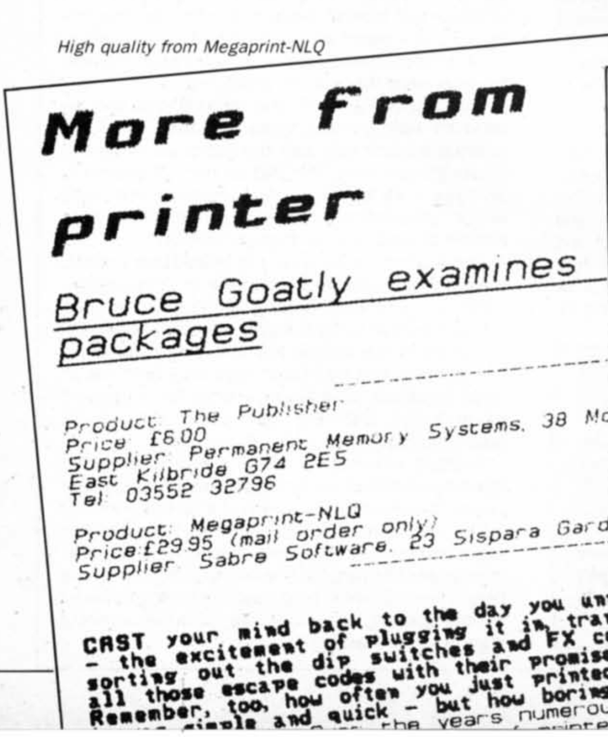
Mnemonic	Escape code	Notes
B Background	Esc"B",s	s=style
C Close box	Esc"C",c1,c2,t	c1,c2=column nos;t=type
D Dummy character	Esc"D",c$	
E Emphasis	Esc"E",n	n=0 or 1 for off and on
F Font	Esc"F",n	n=font number
G Galley line start	Esc"G",c,s	c=column no.;s=style
H Height	Esc"H",n	n=1,2,3...16 for height multiple
I Inter-line gap	Esc"I",n	n=1/72in units
J Justification	Esc"J",c1,c2,t$	c1,c2=column nos; t$=type letter: L, R, C or B
L Linespace	Esc"L",n	n=1/9in units
O Open box	Esc"O",c1,c2,s	c1,c2=column nos.;s=style
P Pitch	Esc"P",n	n=cpi: 10, 12, 15 or proportional
S Super/Subscript	Esc"S",n	n=0,1,2,3 for camel, super-, mid-, and sub-script
T set horiz. Tab	Esc"T",c$,c1,...	c$=tab char.; c1,... up to 10 tabs
U Underline	Esc"U",s	s=style
V set Vertical tab	Esc"V",c$,l1,l2..0	c$=vert. tab char.; l1,.. up to 16 vtabs
W Width	Esc"W",n	n=1,2,3...16 for width multiple
X Macro	Esc"X",n	n=0,1,2...10 for number of macro

Figure I: The Publisher's escape sequences

*NTQ (Q/D)	Near-text-quality print
*DRAFT (Q/D)	Draft-quality print
*PREVIEW (I/N)(H/S)	Print to screen
*NORMAL	Normal dot-matrix print
*PLEN n	Printer paper length, 1/6in units
*KILL	Disable Publisher rom
*PUBLISHER	Enable Publisher rom
*MACRO	Call up Macro editor
*HELP COMMANDS	List star commands
*HELP CODES	List escape sequences
*HELP FONTS	List all fonts in rom

Figure II: The Publisher's star commands

High quality from Megaprint-NLQ



More from

printer

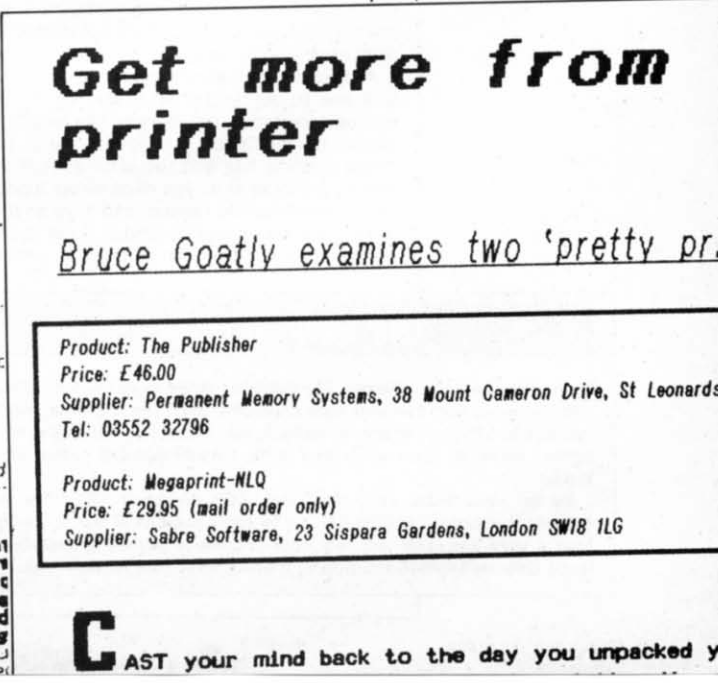
Bruce Goatly examines
packages

Product: The Publisher
Price: £6.00
Supplier: Permanent Memory Systems, 38 Mc
East Kilbride G74 2E5
Tel: 03552 32796

Product: Megaprint-NLQ
Price:£29.95 (mail order only)
Supplier: Sabre Software, 23 Sispara Gard

CAST your mind back to the day you un
– the excitement of plugging it in, tra
sorting out the dip switches and FX cc
all those escape codes with their promise
Remember, too, how often you just printed
simple and quick – but how boring
the years numerou

The same output from The Publisher



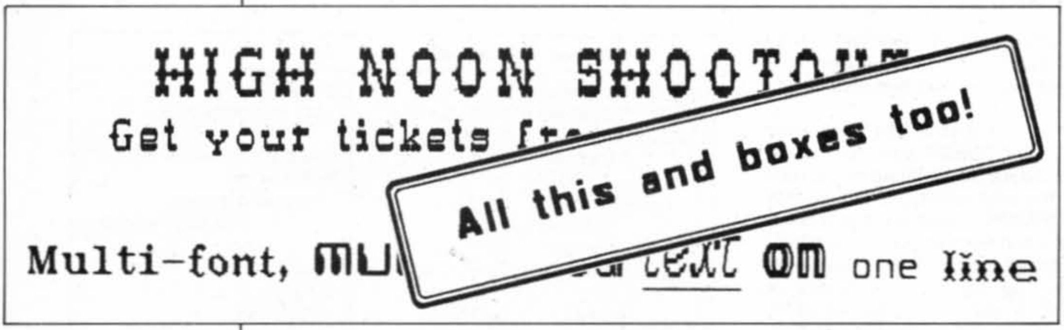
Get more from
printer

Bruce Goatly examines two 'pretty pr

Product: The Publisher
Price: £46.00
Supplier: Permanent Memory Systems, 38 Mount Cameron Drive, St Leonards
Tel: 03552 32796

Product: Megaprint-NLQ
Price: £29.95 (mail order only)
Supplier: Sabre Software, 23 Sispara Gardens, London SW18 1LG

CAST your mind back to the day you unpacked y


HIGH NOON SHOOTOUT
Get your tickets fr
All this and boxes too!
Multi-font, mu text on one line

Two samples of flexible output from The Publisher

◄ From Page 25

use backgrounds and boxes together – which is probably a tall order anyway – and a small variation in interlinear spacing in text beneath a heading in a larger size, which was easily curable. A limitation acknowledged in the handbook – the inability to preview a long document in models without shadow ram – can be overcome quite simply in Wordwise Plus by splitting the document into short files and using Print File commands in a master file.

Product: Megaprint-NLQ
Price: £29.95 (mail order only)
Supplier: Sabre Software, 23 Sispara Gardens, London SW18 1LG.

THIS package consists of a 16k rom, a 35 page manual, one or two font and utilities discs – depending on your disc drive type – and two keystrips. Twelve fonts are provided and the software requires a model B, B+ or Master and an Epson-compatible printer supporting double density graphics.

One thing you do not need is a word processor because the software provides its own document editor which prepares text in the format required by the printing module. On entering the document editor you are confronted with four lines of multicoloured abbreviations and numbers – this is the first instruction line with its associated line of text, empty at this stage.

All text is automatically preceded by an instruction line to define the necessary settings: Font number, font drive, left margin, line length, width factor, height factor, justification type, proportional spacing flag and tab settings. Before you can do anything at all you must either load a text file or specify a font number and drive so the font width information can be loaded. Next you follow the prompts and alter the settings as needed for the first line and then you start typing your text.

The program checks how long the line will be as you type and automatically starts new ones when required. Codes for tabs, underline and inversion can be added as you go along. Other text processing facilities available are a swap case function, an insert/replace option and two markers for use in copying or deleting sections. At the end of each line you can specify how many blank ones should follow.

If you are part way through your text and wish to change one of the settings you must insert another instruction line, which will initially be a copy of the first one. You then have to alter or check each of the settings before going on. If you change a width setting or add or remove words in the middle of your document the later text may need reformatting so all the lines are as full as possible – this is automatic but may take some time in a long document.

At the bottom of the screen is a data line giving information about the whole document, such as what its physical length will be when printed. This serves to let you decide where page breaks should be.

Before printing a text file – which must first have been saved to disc – you are asked to select which lines you wish to start and finish with, an unusual and helpful feature. Printing is straightforward as long as all the fonts needed are available without changing discs. Otherwise you will have to swap discs when prompted.

The font designer on the utilities disc can be used to edit existing fonts or, after you have created a blank one with the initialiser program, to design your own. The grid for each character is so large – 48 by 48 – that operations like flood fill on selected areas are provided. There is a choice of keyboard or joystick control.

Because of the detail in the characters – which makes them suitable for printing in large sizes – each font is nearly 27k long. This seriously limits the software in several ways, the most important being the need to load the font afresh for every line printed. This may be all right for a few lines of large print but is wearyingly slow for a page of single-height text. The instruction line concept also restricts you to one font per line.

Another drawback is that margins and tabs must be specified in double density graphics dots rather than tenths of an inch – a simple multiply by 12 routine in the software would have avoided the cumbersome numbers involved. It is also impossible to fine tune the line spacing, so single height text is either crammed together or almost double spaced, but with large print this is not a significant problem.

THE JURY RETURNS

Of the two packages reviewed, The Publisher is the more powerful, flexible and friendly in use. It is also more expensive. What you are paying for is a versatile text-formatting system that gets you almost into the realms of DTP without having to learn whole new skills. I would certainly recommend it highly.

On the other hand, while Megaprint-NLQ's document editor has some features that make it irritating to use for large amounts of text, if you don't have a word processor and only want to produce posters or leaflets with large, quite well-formed characters, it would serve your purpose well.

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ARCSIN	ARCCOS	ARCTAN	ARCSEC	ARCCOSEC	ARCCOT
ARCSINH	ARCCOSH	ARCTANH	ARCSECH	ARCCOSECH	ARCCOTH
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For example, a standard problem might be to differentiate SIN(COS(6ax+1)), or, harder, to integrate ARCTAN(x).

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Mass storage for Masters

Tony Leah has an exclusive preview of a new type of disc drive

PERIPHERALS specialist Cumana has taken the industry by surprise by unveiling a 10Mb removable disc cartridge drive for the BBC Master at an education show in Buxton. The 5.25in disc device comes three months after the release of similar products for PCs and the RML Nimbus. It's an unexpected addition to the Cumana range because the earlier drives were incompatible with the Master ADFS.

Cumana was not expected to attempt the difficult and time-consuming task of converting the technology to the Acorn machine. But hush-hush backroom efforts have resulted in a finished product boasting the same powerful facilities contained in the earlier versions.

"The unit is the same as that for the Nimbus", Cumana engineering manager Chris Magee told *The Micro User*, "but we had to have the software completely re-written to make it compatible with the ADFS".

Magee describes the task as: "A reasonably big job but one we believe has been worthwhile. The result gives the Master a capability it has never known before – 10 megabytes of disc storage on removable cartridges".

The product is so new that it didn't even have an official name or number when we first saw it. The drive will eventually be available in two versions – single and twin. The former could be available this month and is expected to cost £499. The new drives will be supported with Cumana 10Mb disc cartridges available either singly or in packs of three.

Cumana anticipates the biggest demand for the new drives will come from the education sector: "It's an ideal storage medium for pupil profiling, syllabus structuring, school administration and so forth", said Chris Magee. "Or it could be used for Winchester backup or as a file server on Econet and other applications.

"Users can maintain as many cartridges as they like – in the case of schools it means all students on a course could have their own personal cartridge files. And there's the added advantage of security – being able to take a file away with you for safe keeping. Any combination up to a total of two Winchester and two 10Mb drives – the dual unit – is possible".

Could there be a similar product in the offing to serve the BBC Micro? Says Chris Magee: "At one time we did hope to produce something similar for the BBC Micro as well – but I'm afraid it looks as if this just isn't feasible. However we will continue to support it with our existing range of drives".

Single drive version...

...and the double

NEW DRIVE IN BRIEF

- 10Mb formatted.
- 5.25in half height.
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- Hard hubs for interchangeability.
- Winchester performance.
- Embedded SCSI controller.
- Operating instruction manual and software.
- 50-60 percent faster than standard floppy disc unit.

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Software for the above features is provided on the board, this includes a complete range of SWI's, and star commands.
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A box with the standard phono and video BNC sockets which could not be fitted on to the back of the podule. A composite to RGB decoder is also provided for the video digitiser allowing 16 million colours to be digitised.
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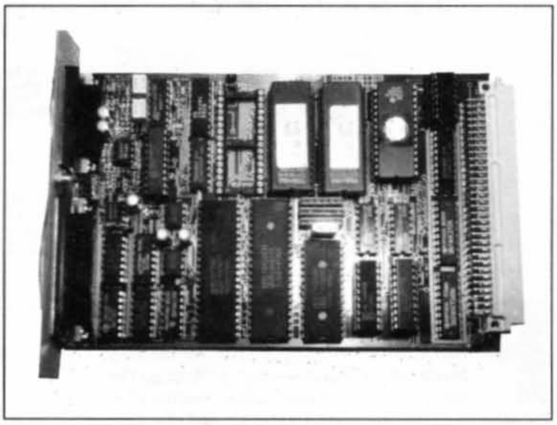
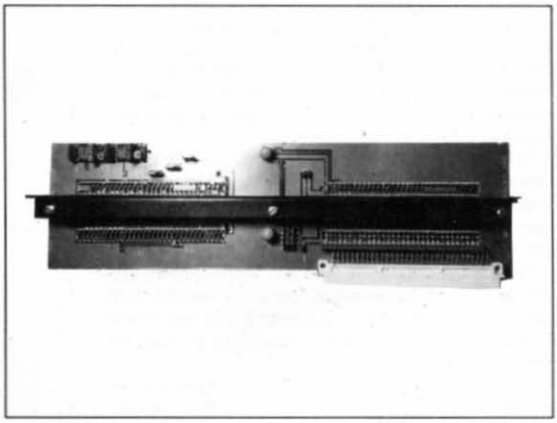
Due to the expected high demand for these products we can not accept credit orders, business is on a first-come first-served basis. Payment is by cheque, P.O. or cash. Please add VAT to all the above prices, postage is inclusive.





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SOFTWARE SCENE

Corruption ... a way of life

Price: £24.95 (Archimedes disc)
Supplier: Rainbird, 74 New Oxford Street, London WC1A 1PS.
Tel: 01-240 8838

THE adventure Corruption begins where Hampstead ended – in scenario, sophistication and subtlety and just about anything else you care to think of.

The story opens with you, all bright-eyed and bushy tailed, having just earned a partnership in a City firm of brokers. Your task initially is to stay alive, later to stay out of jail, and finally to defeat the machinations of those by whom you have been lined up as a fall guy.

This attractively presented package consists of an Archimedes disc, a tape – *essential* listening before starting – and a nice little addition to your Filofax giving playing details, encyphered hints and some very useful background information.

To get the full benefit of the graphics you need one megabyte of memory – which makes me so glad I have a Archimedes 310M. Should you have a backplane and rom expansion card fitted, you might well have to enter *UNPLUG Podule before the game will run. After that, simply enter *GAME and you are up and away.

I was astounded at the quality of the loading screen – it really did look just like a photograph – but I was less impressed by the banal music that accompanied it. Pressing the spacebar soon relieved that problem and there I was in my new office being reassured by David, my new partner, who then asked me to do a little errand for him.

The playing screen is split into three. At the top is the name of your location and – disguised as a clock – a move counter. Below that is the graphics window showing one of the superb illustrations, and finally text of a quality equal to the graphics.

There are also four mouse-operated icons labelled Files, Text, Goodies and Specials. Files provides the Save, Quit, Restore and Restart options and Text offers a variety of options giving combinations of message lengths and graphics. To my mind Normal is the best of these, since it provides a full description of each new location and a shorter one when you next revisit.

Goodies provides you with an inventory, a list of the exits from each location, entry to the hint decoding facility and Look which re-describes the current location in full. Specials reveals the option to send all the text to a printer – a useful way of keeping an accurate record of your progress – and it also provides your score and a list of pronouns with their referents. This assistance is vital to your understanding what you have to do. Finally, not least, a list of the game credits is provided.

Thus you start this fascinating adventure well equipped with utilities to assist the game play. The parser is fairly sophisticated and – as the instructions make clear – allows such input as:

OPEN THE DESK'S TOP DRAWER WITH THE MASTER KEY AND LOOK INSIDE IT

or:

GET THE FAKE BLUEPRINTS FROM MY JACKET POCKET AND PUT THEM INTO THE FOLDER.

You can talk to the various characters met in the adventure, ask them about other characters and give them information. This is a vital tool in building up a clear picture of what you must do.

Initially I wandered around innocently, doing David's bidding, accepting everything I was told at face value and so on. I dutifully explored my work area, popped into the loo to powder my nose, met Bill Hughes – such a nice, trustworthy man – and then went to do some shopping.

Unfortunately I forgot about my credit card and landed up in the slammer along with a most dubious character called McNally.

Using the restart option, I tried again. This time I explored a little more carefully and discovered how vital to progress the use of the word EXAMINE is: You won't get far without frequent use of this instruction. I helped myself to the contents of my own filing cabinet, talked to a number of people and once again went out exploring.

This time I managed to get run over: There must be a way of leaving the hospital without being encased in a coffin, but I haven't quite worked that out yet, even though I am progressing where mobility is concerned in spite of polar bears. However, that dratted Nurse Stephenson will keep popping me back into bed all the time.

Later explorations have involved listening at doors, vandalising a Volvo to good purpose and having a tedious time with my wife. Similarly, I've explored the park carefully and I am having driving lessons because I'm sure that a car chase is involved somewhere.

There's a motto writ large on the underside of the packaging box – it reads: "In the real world, the good guys rarely win." Providing you take that on board, you'll stand a fair chance at cracking this superb adventure.

Readers will realise that I've not succeeded yet, but I'm working on it. I've never before been so stunned by the graphics that I've taken them as an integral – and essential – part of an adventure game rather than optional illustrations that can be turned off at will because they tend to interfere with the text and thus the storyline.

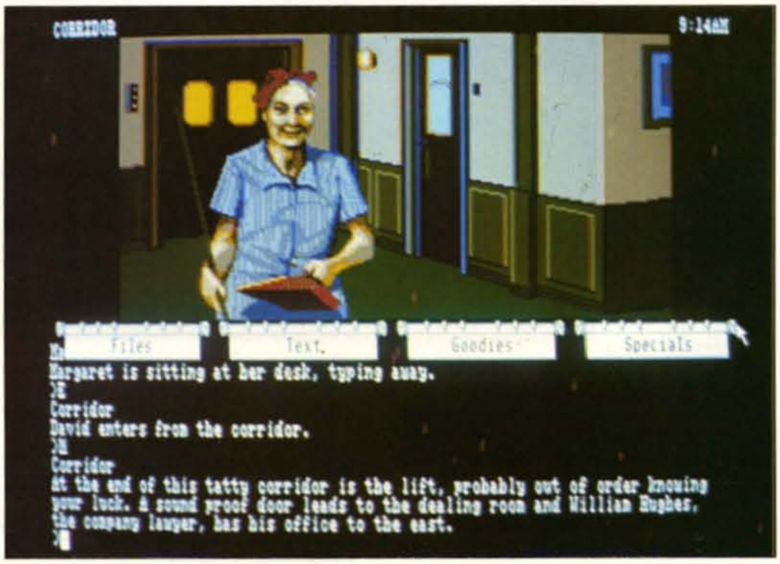
Where there are no illustrations, the text is well able to stand on its own. Here's an example:

'The stale air of the city hangs all around you here, clogging your lungs. The only refuge from the fumes and the crowds along London Road is to cross over into the relative seclusion of the park. The only safe means of crossing is via a set of traffic lights to the north, outside Le Monaco restaurant. Your office building is to the south and a ramp leads east into the office car park.'

This is the class of adventure that Archimedes owners have been waiting for – it certainly exploits the memory and graphics capability in a way that I've not seen before. I can't wait to see other games of this calibre.

Mad Hatter

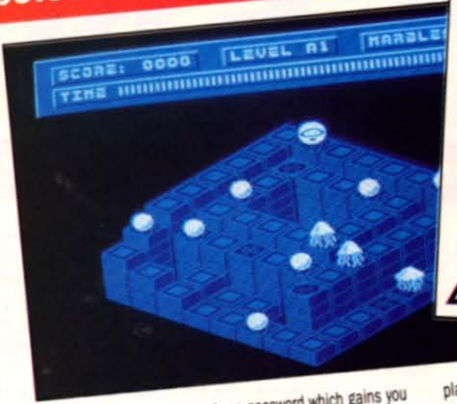
Presentation	9
Atmosphere	9
Graphics	10
Value for money	9
Overall	9

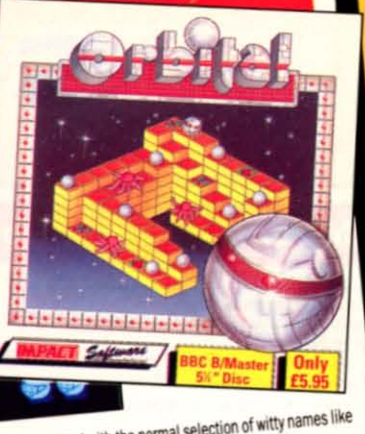


```
Margaret is sitting at her desk, typing away.
>E
Corridor
David enters from the corridor.
>W
Corridor
At the end of this tatty corridor is the lift, probably out of order knowing
your luck. A sound proof door leads to the dealing room and William Hughes,
the company lawyer, has his office to the east.
>
```

Orbital ... antidote to poison

Price: £4.95 (tape), £5.95 (5.25ins disc), £6.95 (3.5ins disc)
Supplier: Impact Software, Neepsend House, 1 Percy Street, Sheffield S3 8AU.
Tel: 0742 769950





FOLLOWING the great success of Clogger and the disappointing Zenon, Impact has produced a neat little game called Orbital and while it is by no means a future classic, it does have quite a lot going for it.

It's simple to play but is difficult enough to keep you interested and entertained. The idea is that you move Ozzie the Orbital around the 12 tiny worlds that make up the home of the deadly Octopodes.

The fact that these worlds appear to be made up of building blocks is a bit disconcerting at first. But you don't really worry about that as you only have a limited amount of time to move around, collecting the plutonium marbles which are liberally sprinkled about. The marbles have been created by the Octopodes in order to poison the Orbital race. Also patrolling the world are some of the Octopodes, and they will kill Ozzie if they catch him.

As Ozzie, you move around the world and when you touch a marble, it vanishes. The problem is that you can only move along flat surfaces or drop down to a flat surface one layer below – fall too far and you shatter. The only way of regaining the higher ground is by moving on to a teleporter which transports you to a fixed point. It can be used as many times as you wish.

The 12 worlds are divided into groups of four. When you complete a group, you acquire a password which gains you entry into the next four.

Once all the worlds have been emptied of all their marbles – a task I have so far failed to perform – the Octopodes have a contingency plan. This involves them placing a replacement set of marbles and making the world invisible.

The game has neat graphics which look good in colour but are just as clear in monochrome. It also has about half a dozen sound effects, such as a chime whenever a marble is collected and a smashing noise when Ozzie is shattered. Added to these are a random collection of notes playing while the title screens are displayed. Apparently it took two people to create this tuneless beeping.

There is the usual high score table which, when you start playing, is filled with the normal selection of witty names like J. T. Kirk and Old Reptonian.

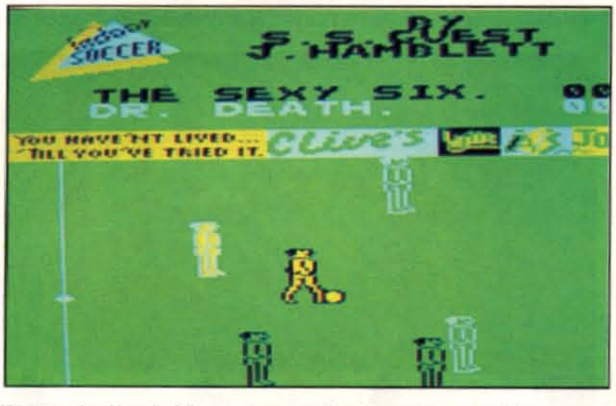
So if you like games which need a little bit of thought, this is one for you. It isn't complicated, but it contains a few interesting problems which should keep you amused for a few hours.

Llewellyn

Sound	6
Graphics	8
Playability	8
Value for money	9
Overall	8

Indoor Soccer ... a kick inside

Price: £1.99
Supplier: Alternative Software, Unit 3-6, Baileygate Industrial Estate, Pontefract, West Yorkshire.
Tel: 0977 797777



ONCE upon a time there was Matchday on the BBC B. Various attempts have been made to produce similar games since then and Indoor Soccer from Alternative Software is the latest. It is limited by not having a one-player option so you will need to find a friend to play against.

To simplify the rules this version is reduced to soccer six – the indoor variety of football – with surrounding walls to keep the ball in play. Your controls are the standard left, right, up, down and kick. As is usual in this type of game, you control only the man nearest to the ball, the rest being operated by the micro. The controlled footballer is highlighted with a different colour.

For once – and this is unusual – the controls all seem to work. Even the speed is acceptable and does not give the feel of footballers playing on a treacle field. Against this must be set the almost intolerable flicker. Ten minutes of it would probably give most people a blinding headache. Fortunately one of the options is to set the length of the game.

The sound can be turned on or off, the control keys can be altered and the inappropriate default names can be changed to something more suited to a kid's game. There are some nice touches in the graphics too – the side wall of the football pitch carries adverts and messages.

The instructions on the cassette inlay are basically untruthful in any of the three languages. There is no one-player option, different skill levels are not obtainable, I'm glad to say that fighting does not break out between players and there is no need for penalties – that's just as well, as they don't exist. Alternative must do something about these totally misleading statements.

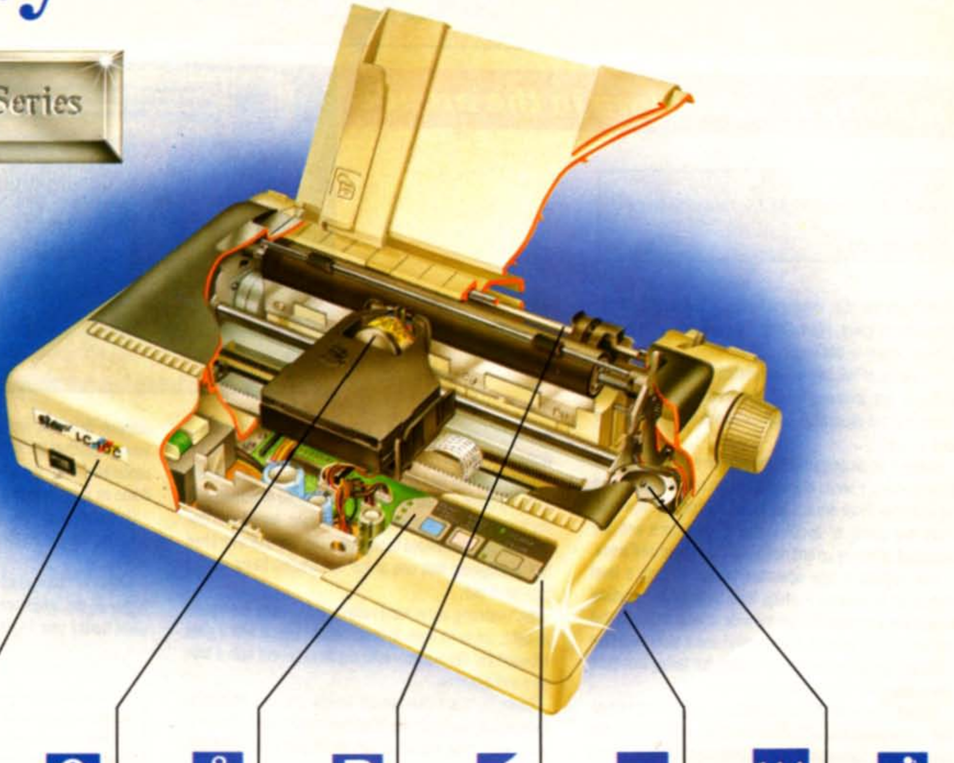
Despite these criticisms, the game is still fun – in small doses – and if you have access to a second player, you can't go far wrong with this at just £1.99

Rog Frost

Graphics	6
Sound	5
Playability	5
Value for money	7
Overall	6

Quality from the inside out.

The Business Series



The multi-font LC-10 is simple to operate, easy on the eye and comes complete with some features you won't find on many more expensive models.

The LC-10 is compatible with almost every computer's needs whatever the system. It can emulate most industry standards with ease, (there's even a Commodore version) a standard feature that we think should always be included. For connection over longer distances, there is even the option of a low-cost serial converter. And the range includes two models that also give you the option of first class seven colour printing.

Putting the LC-10 to work couldn't be simpler. At the mere touch of a button on the front control panel you can set your margins, choose from one of eight Near Letter Quality fonts and pitch sizes or simply put the paper feed into action. (No more inconvenient DIP switches to hamper you). And with the clip-in replacement ribbons, we've made ink stained fingers a thing of the past.

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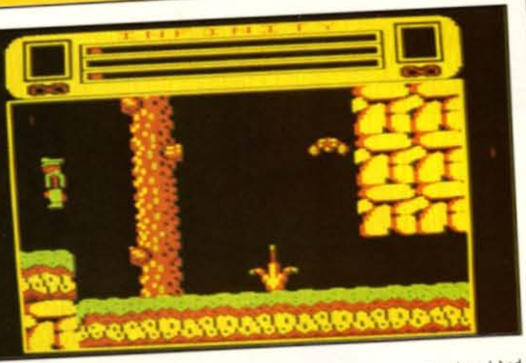
Infinity ... adventure in the arcade



Price: £14.95
Supplier: White Panther, PO Box 132, Chislehurst, Kent BR7 6LJ.
Tel: 01-467 7451

WHEN I saw the title, I thought I'd been sent a copy of the latest Repton game. I was wrong – there are no little green-skinned critters in this one.

As a matter of fact I am not completely sure of the storyline at all, as the scribbled sheet of instructions that accompanied the pre-production copy contained only a list of the keys to use.

Infinity is an arcade/adventure game on a large scale. The playing area is a series of interconnected screens and on the surface level these are usually linked horizontally. However, there are plenty of opportunities to play Jack and the beanstalk, shinning up and down trees to explore new areas.

You progress in true adventure fashion through a level hampered by hazards – which tend to be of the physical variety like crevasses that are too wide to jump and walls that are too high to scale. A devious mind and a stout heart are often enough to bypass such obstacles, but failing that there are useful objects to be found and used.

I'm not sure whether the instructions would have helped, but I sometimes had difficulty in deciding what some of the objects were. I attempted several unsuccessful leaps from a cliff, hoping that an umbrella I had found would slow my descent – but alas, I died every time. A brief conversation with William Scales – one of the two programmers – revealed that my umbrella was in fact a pickaxe. No wonder I fell like a stone.

Another useful tip I gleaned from him was that any object currently being carried could only be dropped or activated in the location where it was meant to be used. Armed with this information, I proceeded to press the Use key whenever I had half a suspicion that one of the two objects being carried may be of use.

With watering can in hand I attempted to water every plant in sight, but to no avail. In desperation I tried it with a giant redwood and hey presto – even big trees benefit from a little love and attention.

Down in the subterranean levels you will encounter extremes of heat and cold. Whatever you do, don't attempt to jump when there are stalactites above your head – the consequences are dire.

The game's graphics are large, reasonably well detailed, and smoothly animated, but I was a little annoyed by the collision detection routine. On numerous occasions I had avoided death at the hands of a flying beastie by a good half centimetre when the program judged me to be deceased. Come on guys, play fair.

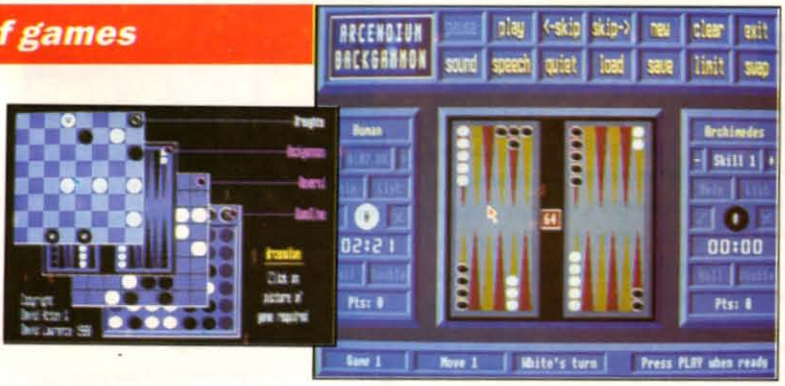
On the plus side, you can save your position to disc at any time and there is also an enhanced version for use with the Master.

Infinity is a competent arcade/adventure game that scores highly on the adventure front. You can exercise your brain while flexing your fingers.

Jon Revis

Sound	7
Graphics	8
Playability	7
Value for money	8
Overall	8

Arcendium ... board of games



Price: £14.95 (Archimedes disc)
Supplier: Alien Images, 5 Victoria Lane, Whitefield, Manchester M25 6AL.
Tel: 061-766 8423

ALIEN Images' Arcendium consists of four popular board games of the type you play to relax, as opposed to the brain cracking types like chess. These are Draughts, Reversi, Backgammon and Quadline. Included is a fairly detailed booklet describing the games, their rules, how to play them and references as to where you can get more information – a neat touch.

All the games allow two players or let you compete against the micro. But be warned: The computer plays a mean game on the highest skill levels. This is directly controllable in Backgammon and implied in the other games by limiting the thinking time. In fact the micro displays its depth of thought as it goes. You can get the machine to play itself as well, which can be quite instructive.

There are a host of other options too – sound, voice or silence, pause, back-step moves and save and re-load a current game position. The latter is very unusual in this type of game.

One of the commonest pitfalls encountered with micro implementations of board games is that of rule variations, a problem particularly relevant to draughts where many people have different views on the huffing rule in particular. Some don't agree with it at all, whereas others allow traps to be set where your opponent is given two piece taking moves at once so that at least one of the attacking pieces is forfeit. It would have been nice if Alien Images had been able to make some allowance for this.

There is a similar problem with Reversi – otherwise known as Othello. Usually the game starts with the first four pieces already placed alternatively in the centre of the board. However, this implementation starts with no pieces set and lets you place the first four with the whites adjacent. Apart from that, the game proceeds as you would expect.

I'm not a Backgammon player so I had to pounce on one of my friends to run through it. He was impressed, but found a couple of oddities. Not familiar with micros, he quickly got to grips with the mouse but took a while to work out how to take pieces from the board.

In fact this is done by clicking the mouse only once to mark the piece to be moved and then going straight to the tick and clicking on that. Normally you need to click on the position you want to move to as well. This is detailed in the instructions, but can easily be overlooked.

Quadline, or four-in-a-row, is a straighforward conversion. Mouse control is very useful as you can play a fast but relaxed game.

If you like board games then this compendium is a must. Even if this isn't your cup of tea, the disc is worth getting to have a look at really neatly laid out games.

Terry Blunt

Sound	8
Graphics	9
Playability	7
Value for money	9
Overall	8

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3 versions ADM/C(11) – ADB(12) ADE (13)
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ACP have totally re-written the Acorn 1770 DFS, enhancing existing features & adding new ones. The result is a very fast and powerful disc filing system with the ability to operate in double density occupying both sides of a disc (640K). Automatic file relocation, improved file handling, 62 file catalogue and Sways RAM can be used as a fast RAM DISC (requires 1770 Interface).
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PRES – ADVANCED FILE MANAGER

The ultimate 'front-end' for ADFS and DFS includes:

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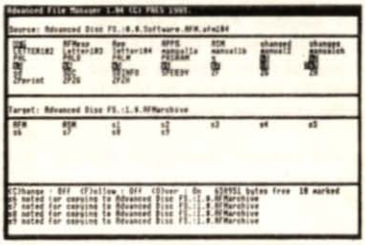
Delete – deletes any number of files
Rename – rename multiple files using wildcards
Copy – extremely comprehensive file copier



Screen picture shows AFM in Copy mode on Master Turbo

AFM follows the PRES 'Master Plan' of upwards compatibility – it runs on Electron, BBC B, B+, B+128, Master 128 and Compact, with Second/Co-processors and Acorn-compatibile versions of DFS & ADFS.

AFM has four distinct modes:

MENU – allows browsing through the files and directories on a disc. Files are started from a menu of up to 7 options chosen for a selected ROM. Loaders are provided for Basic, The Basic Editor, View, ViewSheet, ViewStore, ViewSpell, Edit, Wordwise (+) and InterWord. This list can be expanded infinitely using an Acorn-approved OSWORD call. . . full details and example in the manual..

DELETE – allows files to be marked and then deleted with one keystroke.

RENAME – allows one or more files to be marked and then renamed using a wildcarded name, ie one which varies with each file renamed. Thus you could rename s1, s2 and s3 to be s1_old, s2_old, and s3_old in one operation. . . and that's only the beginning! As well as using the whole of the original name you can also pick out individual characters to form part of the new name.

COPY – the strongest feature of AFM. It is a two stage copy routine. With both source and target directories shown on screen the files to be copied are marked. Once all the files have been marked copying is started and the computer can be left to get on with it!
Large files can be split across several disks, and recombined.

As much as possible of the computer's memory is used for copying files, including unused parts of shadow screen memory, sideways ram banks (inc. AP7), ram cartridges (inc. ABR (32K) and AQR (256K)), tube memory (up to 61K), B+ paged ram (12K) and unused parts of the Slogger Master Ramboard (Electron).

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B B+ M

Making pillaging a pleasure

The Mad Hatter ends his raid on Twin Kingdom Valley

PILLAGE is a lovely word to my mind – nice and graphic – and pillage is what we are about to do as we polish off the final sections of *Twin Kingdom Valley*. Refill your lamp in the workshop of the Desert King's castle, collect the two bags of silver originally carried by the king's guards and the crown worn by his late majesty. Give them to the giant and climb the castle stairs.

Open the door at the corridor leading to the west turret and take the wooden staff found within – this is the ultimate weapon and you can't finish the game without it.

Now proceed to the throne room and give the ball of gold to the giant – don't forget to wait for him to catch you up as you move around. Up the north turret you go and belt the dragon with the wooden staff – I spent ages pouring water on this fiery monster before trying the staff.

Take the master key and go to the east turret, hit the witch with the wooden staff and then give the staff of gold to the giant. At this stage he begins to look like yours truly dutifully following the memsahib around on a shopping spree.

Finally, open the door to the south tower and up you go to the chest. Here you need to work things out carefully – either give the giant everything possible, including the lamp, so that you can – just – carry the chest or *you* carry as much as possible while the giant carries it.

You may well have to make two trips to the cabin. If you do, don't forget to have a drink of water on the way and refill the lamp as well. One advantage of Twin Kingdom Valley is that you can – unlike most adventures – travel safely in the dark. This means it is just possible to do everything in one go.

Deposit everything back in the cabin and leave yourself armed with the jug full of water, axe and lamp and let the giant carry the chest. Now go to the gold cave which is found in the sloping maze beside Watersmeet. Enter the maze and go W, N, E, E and so set eyes on the gold river.

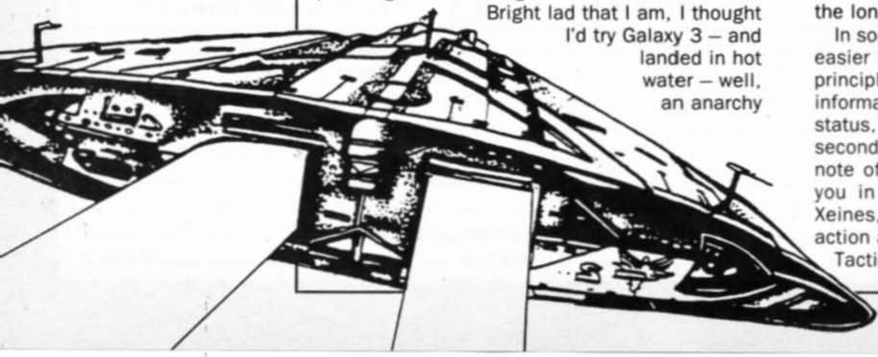
Finally comes a tidying-up operation. Go to the chasm and wave the short wooden rod to form a crystal bridge. Cross it, track down the sand lurker and kill it for the last bag of silver. Have a drink if you start to feel dry, and then collect the last bag of gold from the mountain path which is located E, N, N and N from the waterfall.

Fill the jug with gold from the gold river – where the secret of life is – and take it to the cabin. Last of all, have a drink, go back for the secret of life, take it to Watersmeet and look at it.

Second mission solved

I AM dotty – OK you all knew that – but my dottiness has extended to missing the **Elite** second mission because I simply forgot that moving to Galaxy 3 is what triggers it. What pushed me towards the solution was F. R. Harvey's letter – last month – indicating a problem in reaching the planet Birera. After putting the shout for help into last month's column, I decided to investigate further. Birera did not exist in Galaxy 2 which, as old timers know, is where I've been plodding around for ages.

Bright lad that I am, I thought I'd try Galaxy 3 – and landed in hot water – well, an anarchy system, anyway. Xeines beckoned happily – and various nasties tried to prevent my arrival.



I quickly opted for another system in the galaxy, Erinaen: A poor agricultural feudal system seemed preferable, and since I had all my fuel left, I made my way there.

After that it was simply a question of checking distances to Birera. It turned out that there were actually two jumping-off points, so I suspect that Mr Harvey had been put off by the apparent – rather than the actual – distances suggested on the long range chart.

In some ways, I feel that the second mission is easier than the first provided you keep certain principles in mind. Let's start off with the basic information: The moment you are awarded Deadly status, if you migrate to Galaxy 3 you'll trigger the second mission. Pusillanimous readers will take note of the fact that galactic hyperspace lands you in the environs of an anarchy system – Xeines, to be precise – and you should take action accordingly.

Tactics are important. You will be harassed by

L of a time

*Moving south from the billiard room in **L** takes you to a room where you will only see messages written in code – a substitution code, as it happens. The best way of solving it is to type in the whole alphabet because then, since it will appear in code form, the key for decoding messages can be worked out easily.*

West from the code room is an oriental room. Take the dodecahedron to be found here and retrace your steps to the billiard room, then move E and D to the kitchen, where the cook will ask if you are willing to help.

An affirmative response brings the problem: Bill Hensman says that there is probably some link between the names of the ingredients and the figures, but he hasn't found it. The weights which work for him are the Pythagorean triple – 5, 12 and 13. The reward is an icosahedron.

From the kitchen go up twice and then W to the electrician's gallery. Experiment with the switches here to see what happens and then the correct sequence can be worked out on paper. Take the oar which is located here and go back to the solarium then N to the balcony and D to the garden.

Bill's notes imply that there is an unflagged exit here. At any rate you must move SW and then S to a panelled room where you can get the octahedron. Now move N and N until you come to a lawn by a river where you'll find an old tin bath.

There's a problem here: You can't cross the river while wearing the spectacles, but if you drop them screen messages appear in code. Bill's solution was to move S from the bath, drop the spectacles and then return N and enter the command LOOK.

The next input should be FILL HOLE, and when you're asked what with, reply with one of the Platonic solids. It doesn't matter which one you choose, just keep going until all five holes have been plugged. Now you are in a position to ENTER BATH and CROSS RIVER. Take the oar with you but nothing else.

On the other side of the river follow the path NE to encounter Martin, a gardener. The answer to this horticultural puzzle is in Martin's book, Mathematical Carnival, and was given in my Helpline in the August 1988 issue of The Micro User.

Your reward from the gardener is a rope ladder, and you should now return to the river where you'll meet an APE. He needs to be turned into an OWL via ALE, ALL and AWL so that he can fly off carrying the rope ladder leaving you to cross the river in the bath once more.

Next you should return to the creeper room, moving S, U, S and W get the bottle, phial and key and go W, W, D, W to the L-shaped room. Then go S, W, S to the creeper room where the ladder awaits you. Take it and retrace your steps to the swimming bath.

Here you should go down and then DRINK PINK and DRINK BLUE. This reducing treatment enables you to ENTER HOLE, though if you overindulge you'll find you can't reach it.

Once inside the hole go D and S to the notice by the locked door. UNLOCK DOOR allows you through and then go up to the top of the stairs – the red hair may be ignored. East from the top of the stairs takes you to a circular room and an old janitor. Typing JANITOR produces a message, but the main thing is that you have reached the last stage in the adventure.

● *To be concluded next month . . .*

Turn to Page 38 ▶

Thargoids and their little darlings the Thargons. You will always be attacked by a mother ship accompanied by a Thargon – and it is this misbegotten spawn that you should deal with first of all. The mother ship can wait a little and – depending on your situation – may even provide some gorgeous booty.

You will have the opportunity to visit anarchy systems on the way but – if I may make a suggestion – I would not attempt the second mission until you are almost Dangerous. I realise that some of you will ignore this advice. Nonetheless, a detailed account of this mission will appear in the next column for those who are sensible.

David Kennedy has sent in an Elite hint for those with Master Compact versions. He writes: Try loading a new Commander by the name of JOE=20. While it will not work on all discs, when it does it provides that lovely piece of equipment for the novice, a docking computer.

Now I'm off to investigate those generation ships in galaxy four so, until next month, happy trading – and happy adventuring.

Hall of Fame

Congratulations to Bruce Greig who has sent in a solution to *Perseus and Andromeda.*

Problem Corner

Mark Younger asks for help in *XOR* – which I don't have. How does he work out the code, and where are the last three letters? Over to you, folks.

Can anyone help Adrian Denny: He's lost his copy of *Ten Little Indians* and wonders where the software house Digital Fantasia is to be found these days so he can try for a replacement.

Hatter's helpline

◀ *From Page 37*

James Bush offers help to Robin Keith – stuck in **Time Machine**. After finding the prisms, Robin should insert them into the time machine's slots for two new locations to become accessible. He should go first to the one with the metal plate and lever it using the crowbar – this opens up a shaft for him to go down. This help should get him close to finishing the adventure.

Half Elf offers Mark Hilton some help, too. Mark needed to get the dubloons in **Pirate Adventure** without being killed by the snake. The enigmatic tip is: Parrots don't just like crackers. In **Wizards Challenge** Mark had a problem pressing buttons and the advice here is to look at the figure and try to work out the total using buttons 1 to 8 in three combinations.

Mark Younger asks where the cheese is in **Philosopher's Quest**: Move SE from Picadilly Circus and follow your nose. And Bruce Greig can't stay on the tightrope in **Circus**. I'll bet he's not wearing the slippers.

Julian Arnold has trouble in **Lords of Time**: His mistake is to have poured the poison on to the giant flower in the ninth time zone before entering it. Instead, he should go in and pour the poison once he is inside the root system. Look out for a full treatment of this adventure soon and don't forget there is an illustrated version available from Mandarin in the **Time and Magik** trilogy.

Steve Sharples is stuck in the original **Countdown to Doom**. He has three interconnected questions that all seem to revolve around the blob, though Steve doesn't realise it. He needs to catch the blob in the net then a grateful mum will offer time travel and that will enable him to go collecting crystals – provided he has the navigator box, spacesuit and spices.

Steve also asks if I am related to Brillig, who writes in our sister publication *Atari ST User*. No, but apart from a love of adventures, we do have one thing in common – a Christian name.

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Using what you've got

John Allen delves into his tried and trusted toolkit

AS the BBC Micro has been around for six years, there's a wealth of good software available. So from time to time we at *The Micro User* take a break from reviewing new products and look back at some useful packages which are not so new. A rom really stacked full of utilities is the Advanced Disc Toolkit by Pres – formerly ACP. It's one of those roms that's so useful that you tend to think that it's part of the operating system rather than an add-on.

Although called a disc toolkit, it has many other functions like editing memory or disassembling machine code. Nevertheless it is most useful as an addition to a disc system, providing virtually all the extra commands that you get in the different machine configurations. It works equally well with DFS and ADFS and can be useful for the net, tape or rom filing systems.

Standard commands

Many of the BBC Micro's most useful commands are only supplied as disc utilities. At the last BBC Micro & Electron User Show in London I was asked several questions like: *Is there a way I can format discs on a model B without having to use a formatter on disc?* or *Why can't my Master show an ADFS catalogue for the whole disc?* Both of these problems are solved by having ADT in your machine – multifarious options are available all the time as star commands.

To illustrate some of the uses of ADT look at some of its features:

File copying

XFER allows files to be copied between tape, disc, ADFS, net – and sometimes rom – filing systems. For example, if you have recently upgraded from cassette to disc, typing:

```
*XFER TAPE DISC
```

copies all the files on a tape to the current directory of a DFS disc. Commercial cassette programs won't necessarily run when loaded from disc but at least you can try – and with just one command.

A command which sometimes helps in this case, MRUN, loads a program into memory at its original load address and runs it. This works with both machine code and Basic programs – and sets the filing system to tape if the load address is below the start of free space. If the program accesses disc files, try lowering PAGE before attempting to run, or use MLOAD to load the file and reset to disc with *Disc.

XFER can also be used to transfer single files. For example, to copy FRED from the current directory in DFS to the current directory in ADFS enter:

```
*XFER DISC.FRED ADFS
```

Like virtually all copying utilities, XFER uses the BBC Micro's main memory as temporary storage, so anything there is destroyed, also quite a lot of disc swapping can be required on a single drive system.

ADT contains both a memory and a disc editor. The former displays memory – including sideways roms and ram – in a number of different ways – as text, in hexadecimal form, as text and hex or disassembled to make machine code easier to follow.

When used for disassembly, the operating system entry points – such as *osbyte* and *oswrch* – are given their name rather than the address. Also positioning the cursor over a JMP or other branching instruction and pressing Return moves the display to the section of code which is referred to by the instruction. In any of these modes bytes can be changed by entering new ones on the keyboard.

The disc editor is more restricted in its display modes but is potentially more useful – and more dangerous. It is possible to examine disc sectors and make changes. This is particularly useful when a file has been accidentally deleted because it can be easily recovered, provided that a new file has not overwritten it. Remember, when a file is deleted the information it contains is still left on the disc and only the catalogue entry is removed.

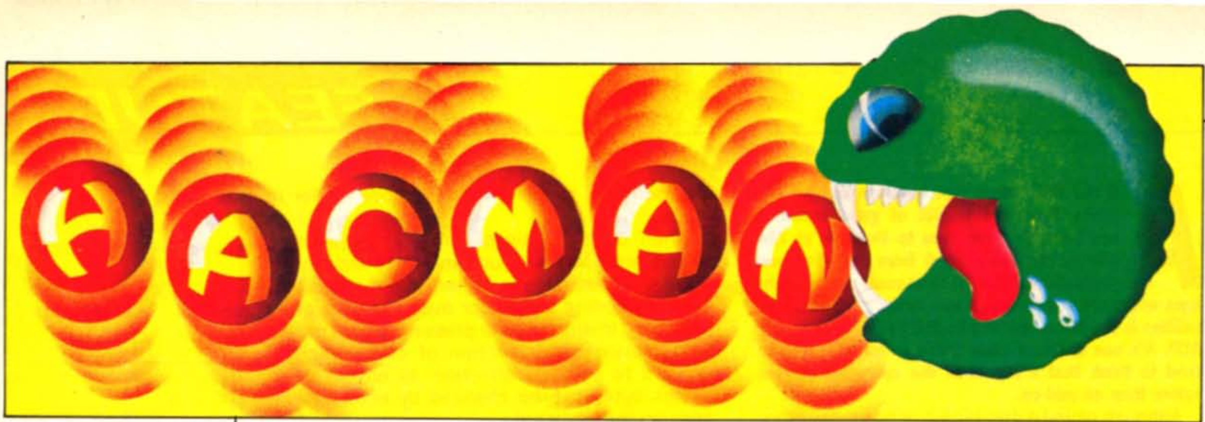
The first time you try to recover a file first make a complete backup of the disc using the *BACKUP command so that a mistake does not ruin all of the files. You then need to locate the file on the disc. Using the facilities available in ADT file recovery and catalogue patching becomes very much easier.

Any serious user of the BBC Micro needs to have some sort of toolkit, I have always used ADT and have never found that it clashes with anything else. I am well satisfied.

Standard commands

Command	Other source	Useful for
*BACKUP	DFS	ADFS
*BUILD	DFS	ADFS
*CATALL	Disc	ADFS
*DIRALL	Disc	ADFS
*DUMP	DFS	ADFS
*FORM40/80	Disc	Model B/Master
*FREE	ADFS	DFS
*LIST	DFS	ADFS
*MAP	ADFS	DFS
*ROMS	Master	Model B
*TYPE	DFS	ADFS
*UNPLUG	Master	Model B
*VERIFY	Master	Model B

The Advanced Disc Toolkit is available at £30 from Pres at 6 Ava House, High Street, Chobham, Surrey GU24 8LZ. Tel: 0276 72046.



B B+

Return of the Barbarian

Hac Man has an exclusive look at Scott's latest

THIS month we have an exclusive review of Peter Scott's new game, Barbarian II. I spent quite a bit of time thoroughly testing it – no effort spared for you – and my first impressions still hold strong. It looks fantastic and certainly surpasses any arcade adventure in existence – of its type. In fact it's better than the same game on certain other types of micro.

The original Barbarian is a straightforward one or two player combat game – a sort of Way of the Exploding Fist without the rules of fair play. It features an impressive variety of manoeuvres, including the (in)famous flying neck chop. Barbarian II, on the other hand, is very much an arcade-adventure. Most of the combat moves have gone – although the flying neck chop still remains – but the new offering has very much more depth than its predecessor.

For a start, you can choose to be either a male or a female combatant – to quote Peter: *No sexism here*. You must use your fighting skills to work your way around more than 80 screens, using objects that you pick up along the way to help you overcome the many problems you will encounter. Each level is mappable and contains two treasures.

The majority of the objects are animated – beautifully – but all with the same purpose – to kick, stab, club or bite any passing soldier of fortune who hasn't quite got the hang of his or her double-headed axe. There are more than 20 different creatures, each with its own unique attributes and styles of movement. A dinosaur, a lumbering caveman, a pair of flying pincers and many more await the unwary.

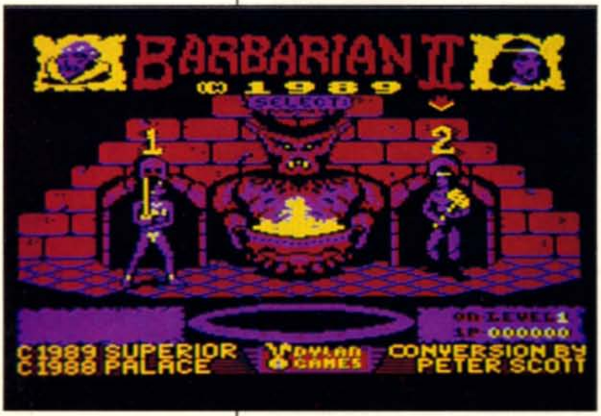
The monsters are by no means the only dangers you will face on your journey through this world. Bottomless pits and rivers of lava will prove equally effective in dispatching a clumsy barbarian.

Some details of Barbarian II's design make interesting reading. Your own character features 45 frames of animation – no wonder it's so smooth – but a lot of work has also gone into creating your opponents. There are six monsters to each level, on average two large, two medium-sized and two smallish. The largest are 56 pixels high, 32 wide and feature eight frames of animation. As Peter says, work that out for memory...

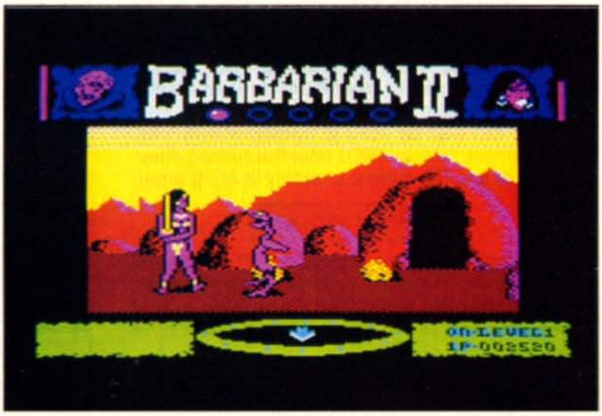
One minor peculiarity is that Barbarian II uses the familiar Z, X, :, / and Return keys, whereas its predecessor – as a two-player game – used Z, X, Q, A and Tab for player one. I welcome the return

Featuring:

Palace of Magic
Barbarian II
Exile



Select your champion



Princess Mariana faces a first level beast the old favourites but experienced barbarians may take a while to adapt.

I am very impressed with Barbarian II – from both a player's and a programmer's point of view. The exploration and problem-solving aspects will appeal to players who want more than just mindless violence, while those intent on wanton slaughter will also find much to their taste.

Decoding the Runes

From time to time a game emerges that is clearly something special. Exile, from Superior, undoubtedly falls into this category. I wouldn't quite compare it with Elite, as many have done, as it is very different. Nevertheless, the work that has gone into it seems to have paid off. In my most recent postbag I received far more letters about Exile than about any other game. It seems to have gone down very well...

In common with the aforementioned Elite, the Exile package includes a novella to set the scene, as well as the usual instruction manual and function key details. The effort put into creating a detailed background is worthy of the work that authors Peter Irvin and Jeremy Smith have put into creating the game itself.

On the back cover of the novella is a series of symbols – the Runes. Those familiar with the game, will remember they are inscribed on the portal in one of the western caves. I didn't pay them any particular attention, but they are in fact logical, and can be deciphered.

Simon Guerrero of Gilsland, Cumbria, says that when trying to translate them they should be treated as code symbols, since they have nothing to do with real runes. Since the game is supposed to be set on the planet Phoebus, and they are presumably runic symbols of the natives of that planet, this is perhaps not surprising.

A number of readers, including Peter York, Mark Rubery and Simon and Richard Hay, have managed to work it out. The message – appropriately chilling – goes as follows:

Beneath lies great danger
For friend and for stranger
Invisible death stalks the gloom
The curse that afflicts here
Our sons and our daughters
Has forced us to seal them in this ghastly tomb
The evil so savage
Dug from deepest of passage
It has twisted the minds and the limbs
Of our children so little
And babies so brittle
Punished are we all for our sins
Of this warning take heed
Lest the evil be freed
Or take up your weapons
And prepare for a fight
Emerge will vile demons
To slaughter the humans
Who released them with rocks
That give off glowing light

Simon Guerrero says that the message contains a clue to help you with a problem you encounter in the game – and I'll leave you to work that out.

BARBARIAN II

Second level dungeons

Freeing that frog

Last November's issue of *The Micro User* proved to be very popular with Palace of Magic fans. This column featured invulnerability routines for the original stand-alone cassette, 5.25in disc and 3.5in disc versions and – in the same issue – we featured a full map.

However, in spite of providing all these unfair advantages, I have received letters from a number of readers saying that they still couldn't get the frog out of its apparently-sealed brick prison. So to plug this unforeseen gap here is a full rundown of the moves necessary to get the frog.

From your start position in the main palace (0,0) climb up the rope immediately above you and make your way to the west palace at -3,0 and get the cross. Go back to the main palace (-1,0) and jump up and get the green and white key. Go out and through the east wood until you come to the balcony outside the church at 8,-1. Give the cross to the vicar who will disappear, allowing you inside.

Go through to A,-1 and fall through the hole in the floor. You are now in the cellar – A,-2. Make your way down to the bottom and use the key you are carrying to open the green and white gate. Make sure that you drop from ledge to ledge rather than falling straight from the top of the screen, or you will hit the floor with a bump that will reduce your energy quite substantially.

Make your way to the top of the screen by the same method and jump through the hole above your head. Go to B,-1, jump on to one of the ropes

Turn to Page 42 ▶

◀ *From Page 41*

then climb up the ladder. Go through to A,0 and climb down the ladder. Go through to 9,-1 and pick up the yellow and red key. Take this back to your starting location in the main palace.

Follow the passage immediately to your left – do not climb the rope this time – until you come to the yellow and red gate in the west palace at -2,0. Open it and you'll find yourself in the passages at -2,-1. Pick up the candle you've landed on, as you'll need it to light your way through the caves and dungeons that stretch between the church and the palace.

Make your way through the passages until you emerge at 1,0 in the east palace. Go right, then down to the east exit (2,-1) and pick up the blue and cyan key. Return to the church and go back down to the cellar.

Go through the gap that was once the green and white gate. You are now in the dungeons. Get the top hat on the left-hand side of this screen if you need it, then return to the position at which you first entered the screen. Fall off, but not all the way down the right-hand side of this screen. Ducking into the passage across the middle of the screen as you fall past. If you miss the entrance to this passage you will fall into a small pit of fire, seriously depleting your energy.

Work your way through the dungeons – there is only one route – until you come to the blue and cyan gate at 8,-7. Open it with the key you are carrying and go straight through: You are now in the caves. Go through here and into the next (6,-7). Here you will find a rope and a top hat in an apparently sealed hole. Climb down the rope and on to 6,-8. You can now see the frog.

Halfway down the rope walk left into the wall and follow this sequence – measured in bricks:

Four left, two down
Ten left, four down
Six right, two down
Eight right, two down
Four right, four down

You are now level with the frog, so you can walk straight in.

To get the top hat on 6,-7 follow a fairly similar route from the bottom of the rope. Again walk into the wall from halfway down the rope on 6,-8. As before: Four left, two down then go all the way to the left-hand side of the screen. This time go straight up – 10 bricks and collect the top hat.

There are a number of other things you must do and objects you must collect – notably the idol – before you can escape from the dungeons. These, however, are the moves necessary just to get the frog and the walled-in top hat. The best of luck to everyone.

I HAVE received a couple of letters from readers saying that my cheat routines did not work on their versions of Palace of Magic which turned out to be those on Play It Again Sam 3. I am in the process of writing equivalent routines for these compilation versions. They'll be coming soon.

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Your technical questions answered by MIKE COOK

PROBLEM SOLVED

Wavery screen

I OWN a BBC B and recently the screen suddenly went weird. I have tried loading games and the trouble is that every mode except 7 seems to produce wavy lines or flashing stripes. Could the video controller be at fault? – **Alex Savvides, Southgate, London.**

● *It's unlikely that the video controller – IC2, a 6845 – is at fault as this is used in all the modes. The Video ULA – IC6 – is probably the cause of your problems, particularly if it's an early one. You can get a replacement from Dram Electronics, Unit 12, Kingston Mill, Chestergate, Stockport SK3 0AL.*

B+ problems

I HAVE a B+ with Mini Office II roms, Speech rom and 1770 DFS. My micro has always worked perfectly but I have now been stumped by a problem: When I turn it on a single note sounds continually and there is no screen output. I have tried removing my roms except Basic but to no avail. What do I do, and will repairs be costly? – **Jeremy Flex, London SW13.**

● *This is the classic symptom of a broken micro. It could be just about anything, because 90 per cent of a micro has to work before anything happens.*

You can try the old standby of making sure all the chips are seated in their sockets by pressing them down firmly and ensuring the keyboard ribbon cable is firmly in position and not broken. Otherwise it's a trip to your nearest service centre and keep your fingers crossed.

Mastering colour video

I HAVE been involved in making interactive video programs for education with a control signal activated from a BBC Micro keyboard. To help me try to understand the system better I have bought a Master 128 for my own use.

I thought it would be a good idea to title my own video tapes from graphic screens using the comp video BNC output, but unfortunately this turned out to be in monochrome.

I have temporarily overcome the problem by connecting the UHF socket to a television with a video output which I then fed into the video input of my VHS recorder – a not very satisfactory solution. I heard that it was possible to convert the composite video output to colour by using a link somewhere on the board. Please could you confirm if this is possible. – **Norman Jackson, Whitley Bay, Tyne and Wear.**

● *On the model B you can simply make link 39 situated close to the video modulator, but there is no corresponding link to this on most Masters and the circuit does not provide for generating a composite colour signal.*

However, you could try connecting a capacitor of about 200pF between the emitter of Q12 – (BC239) – and the base of Q13 – BC309. It should work, and the effect on your monochrome monitor would be a faint patterning or dot crawl on large areas of colour.

Exploding chips

TWO problems concern my disc drive. I can read data already on a disc but when I write it – format the disc or save data – I get a bad track 0 with error 08. I have tried three drives and the same problem occurred on them all. Could I have a faulty 8271 FDC or is the problem much simpler? The Advanced User Guide shows the connections and ICs which should be present, and they are all correct.

Now to my second snag. While trying to remedy my drive problem I turned the machine on and heard a crack, the screen became blank except for a very faint cursor and no text would appear.

From this I can say the 6845 CRTC cannot have blown as the cursor still appears and data may still be stored in memory, but no TV image can be seen. Could the problem lie in the modulator or the video ULA, and if so how do I repair this? – **Adam Nightingale, Blidworth, Notts.**

● *First your disc drive problem: If you have two drives it could be that you have the terminating*

Turn to Page 44 ▶

On the agenda...

- **Sorting out stripey screen modes**
- **Debugging a dead micro**
- **Reiterating the storage oscilloscope**
- **Getting colour video from a Master**
- **Making the PC connection**
- **Suppressing a noisy motor**
- **Demanding more than the current can bear**

◀ From Page 43

resistor fitted in both. This would reduce the signal reaching the drive and could cause your problems. However your power supply could be causing difficulties, especially if you are trying to power your drives from the micro – a practice I never recommend.

Writing to the disc causes a heavier current demand than reading from it and it is possible that your power supply can't cope. Alternatively your drive could be broken and have a fault in the write circuitry.

As to your now dead micro, the sound of a crack implies that something has broken down in the power supply unit. When chips blow they usually do so in serene silence. This could tie in with your disc drive problems, but without test equipment it is impossible to tell exactly what is wrong.

Grabbing waves

HAVE you in any of the Body Building series of *The Micro User* covered the topic of a storage oscilloscope? If so could you please tell me the issue and how to obtain a back copy? – **D. N. Eyre, Head of Computing, Hinchingbrooke School, Huntingdon.**

● *The most recent fast storage oscilloscope was covered in the February 1987 Body Building article. This allowed a fast signal to be displayed and frozen when the spacebar was pressed. Older issues of* The Micro User *can often be obtained from public libraries or you can try contacting Musbury Consultants, who supply the parts, direct – you'll find the address in the Body Building article.*

PC connections

I OWN a BBC B, OS 1.2, DFS 0.90, twin 40/80 disc drives, Watford 32k Shadow Ram, Computer Village memory expansion board CVX-16 with lots of rom and disc software. The memory board has a facility to switch between two rom positions. I recently bought an 80186 co-processor package from Watford – I had my eye on it for years, now the price seems right.

● If I fit the new ADFS and the old DFS in the switching position can I operate the DR Dos and my old software?

● Can I leave it fitted and use the 32k Shadow Ram printer buffer?

And is there any way to tell which PC Dos software will run? – **P.J. Eady, Penzance, Cornwall.**

● *You can fit the ADFS and DFS in the same system and you don't even have to have them in a switched socket. You can change between the two with a *DISC and a *ADFS command – although having them switched means that you don't lose chunks of memory. The printer buffer should still work, but there is no way of telling what software will work with any PC setup short of trying it.*

> *There is no way of telling what software will work with any PC short of trying it*

Noisy motors

BEING a great fan of your Body Building articles I tried my hand at interfacing a BBC B+ with a machine in our laboratory. I thought by using *MOTOR 1 and *MOTOR 0 I could use the cassette relay to activate another 12 volt relay to start a small motor.

The power was taken from the auxillary power source underneath the micro and everything worked fine. Eventually I bought a Master to do the same job on another machine – then my problems started.

Intermittently the program crashes at the same line – just after the cassette relay has switched off and the error messages I receive are meaningless.

I've tried using an independent power source and different Masters without success. I've changed the BBC B+ and Master around but the fault follows the Master: The BBC B+ goes on merrily without any problems. I've also tried using screened cable but the problem still persists.

Can you please help? Is there a difference in the relays of the Master and the BBC B+ such that this fault could be explained? – **B. Jones, Trowbridge, Wilts.**

●*What is happening here is that the motor – when running – is generating interference which is causing your Master to crash. You must be lucky with the B+, with it being not so susceptible.*

You must be just on the limit of what it can take and I am sure if you tried several different micros of the same type you would find some would crash and others not.

You must try to reduce the amount of interference your motor produces with suppression capacitors and inductors. In each motor lead fit an inductor and put a capacitor across the motor – the bigger the values of component the more interference you will suppress. Make sure, however, that the components can stand the voltage and current to which you subject them.

Sideways ram revealed

I RECENTLY bought Exile from Superior and read about the enhanced version for BBC Bs with sideways ram. Could you please tell me about sideways ram? What is it, how does it work, what does it do and where can I get 16k of it quite cheaply for my Issue 7 BBC B? – **Martin Cartwright, Emsworth, Hants.**

● *Sideways ram is read/write memory used in place of the normal roms like Basic and the disc filing system. Normally it is no use to programmers other than those using special techniques in machine code – for example writing specially enhanced games.*

Its other use is to load rom software from disc rather than having to plug in chips. Most sideways rom boards offer the option of fitting in some ram chips. You'll find several advertised in this issue, the one I use is the Aries board from Watford Electronics.

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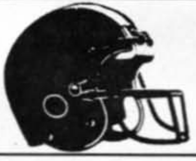

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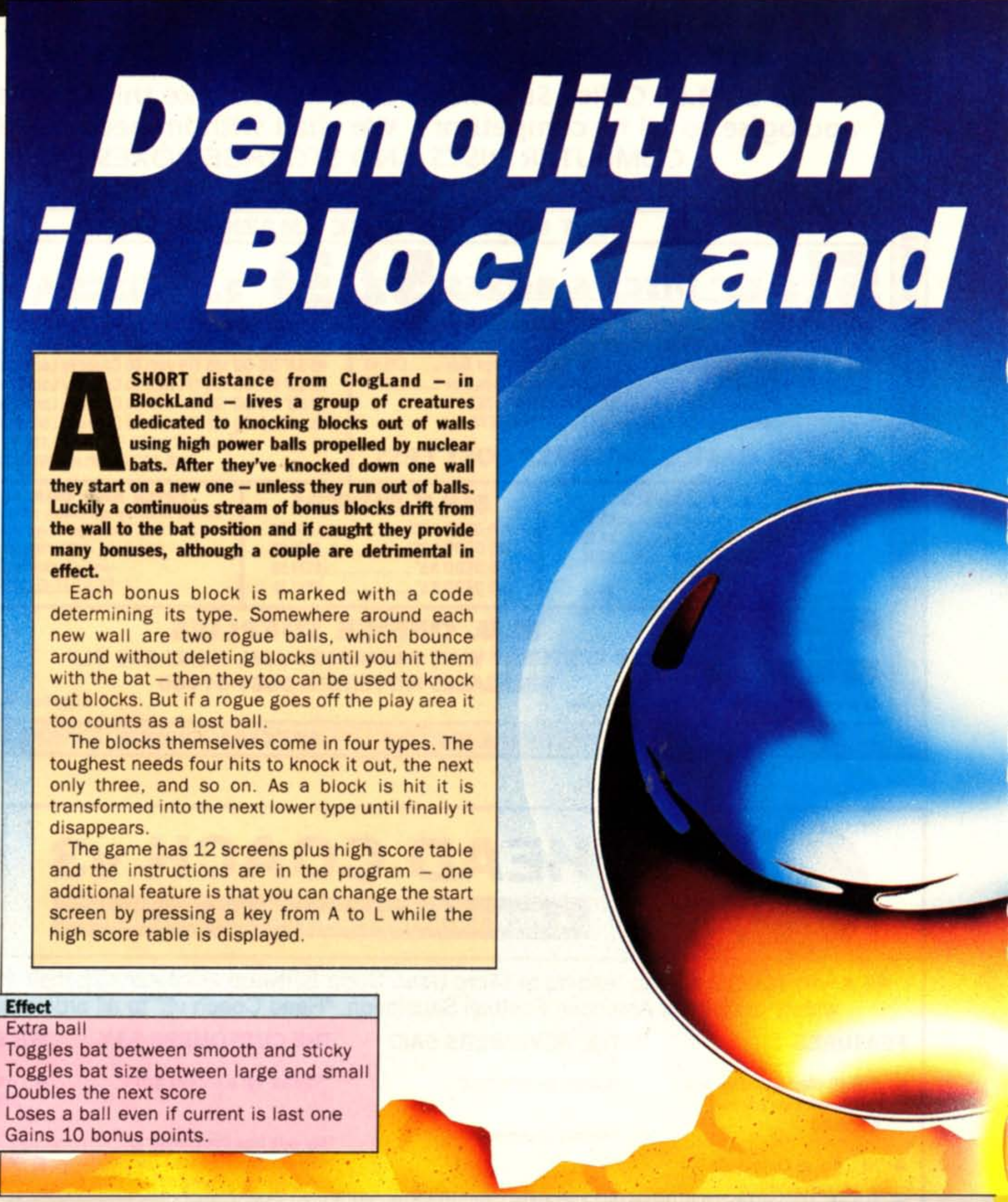
Demolition in BlockLand



Clogger author Gordon Key presents a stunning type-in game

A SHORT distance from ClogLand – in BlockLand – lives a group of creatures dedicated to knocking blocks out of walls using high power balls propelled by nuclear bats. After they've knocked down one wall they start on a new one – unless they run out of balls. Luckily a continuous stream of bonus blocks drift from the wall to the bat position and if caught they provide many bonuses, although a couple are detrimental in effect.

Each bonus block is marked with a code determining its type. Somewhere around each new wall are two rogue balls, which bounce around without deleting blocks until you hit them with the bat – then they too can be used to knock out blocks. But if a rogue goes off the play area it too counts as a lost ball.

The blocks themselves come in four types. The toughest needs four hits to knock it out, the next only three, and so on. As a block is hit it is transformed into the next lower type until finally it disappears.

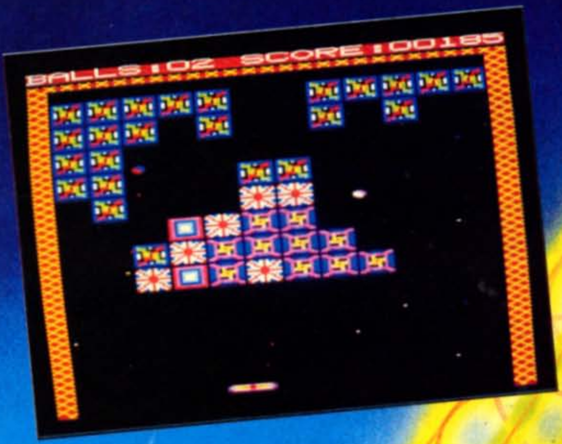
The game has 12 screens plus high score table and the instructions are in the program – one additional feature is that you can change the start screen by pressing a key from A to L while the high score table is displayed.

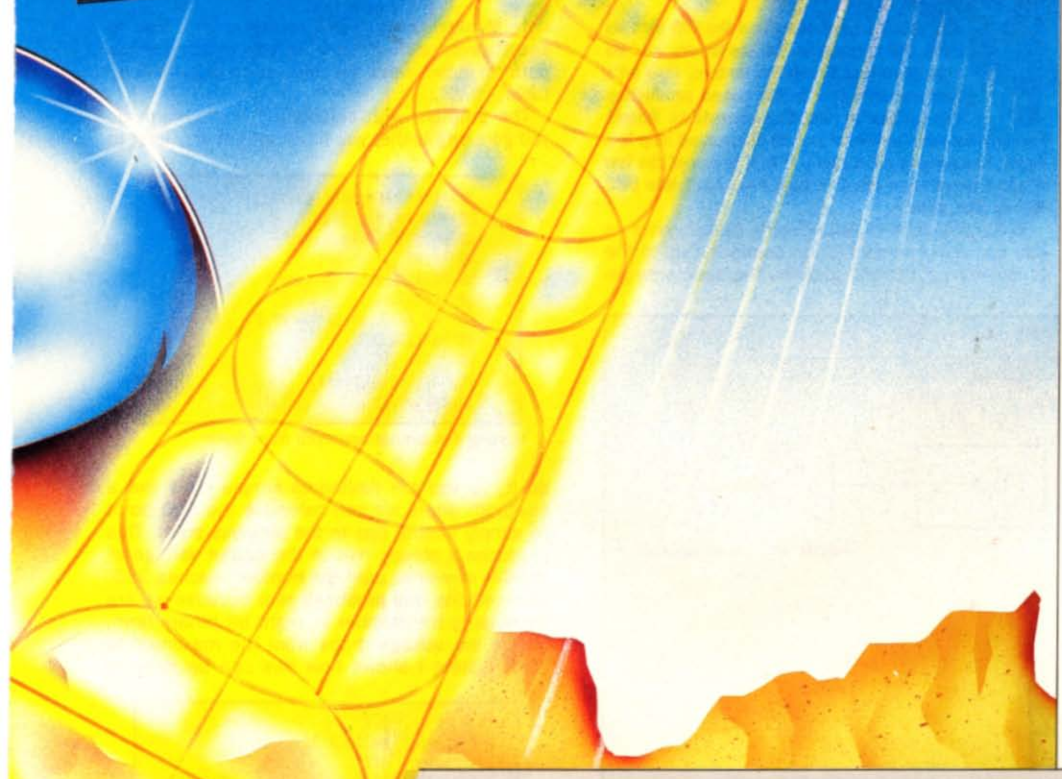
Code	Name	Effect
B	Ball	Extra ball
G	Glue	Toggles bat between smooth and sticky
S	Size	Toggles bat size between large and small
D	Double	Doubles the next score
P	Poison	Loses a ball even if current is last one
10	Ten	Gains 10 bonus points.

Values of the bonus blocks

```
   10 REM Block Breaker
   20 REM by Gordon Key
   30 REM (c) The Micro User
   40 REM
   50 REM *FX4,1
   60 REM *FX220
   70 *FX3
   80 IFTOP>&2D00THENMODE7:HIMEM=&5E00:P
ROCsh
   90 HIMEM=&1F87:PROCinit
  100 REPEAT:PROChisc:S%=0:T%=5
  110 REPEAT:U%=13:W%=43:PROCrd(sc%)
  120 COLOUR129:CLS:GCOL0,3:FORX%=-2332T
01280STEP48:MOVEX%,1023:DRAWX%+2040,0:MO
VEX%+16,0:DRAWX%+2056,1023:NEXT:GCOL0,0:
MOVE0,988:DRAW1279,988:MOVE0,984:DRAW127
9,984
  130 RESTORE960:FORi%=1TO15:READn%:VDUn
%:NEXT:sco%=FNsco(S%)
  140 FORi%=4TO0STEPTRUE:n%=10^i%:VDU128
+sco%DIVn%:sco%=sco%MODn%:NEXT
  150 GCOL0,128:VDU24,56;0;1215;964;:CLG
:VDU26
  160 A%=&202D528:E%=&0A8C0A8C:G%=0:H%=1
:I%=127:X%=30:Y%=240
  170 VDU31,6,0,128+T%DIV16,128+(T%AND15
)
  180 K%=1:J%=0:Z%=14:W%=14:CALLL%
  190 GCOL0,0:MOVE1208,0:DRAW1208,932:
  200 REPEAT:CALL&2488
  210 IFI%=220I%=127:K%=1
  220 UNTILG%=0ORT%=0
  230 IFG%=0ANDT%>0:PROCtn(0):CALL&24D2:
sc%=(sc%+1)MOD12:UNTIL0:ELSEUNTILTRUE
  240 *FX21
  250 PROCtn(10):CALL&24D2:UNTIL0
  260 DEFFNsco(S%):LOCALs,n,t
  270 s=&70:n=&74:!s=S%
  280 FORt=0TO3:n?t=s?(3-t):NEXT
  290 =VALSTR$~(n!1AND&FFFFFF)
  300 DEFPROCrd(m%)
  310 m%=&2188+m%*56:LOCALQ%:F%=95
  320 FORP%=0TOF%:Q%=FNread(P%,m%)
  330 s%?P%=Q%:o%?P%=3*-(Q%>0):NEXT
  340 B%=m%!48:C%=m%!52
  350 ENDPROC
  360 DEFPROCtn(N):RESTORE(400+N)
  370 FORT%=1TO8:READN,D:SOUND1,3,N*4+1,
D:NEXT
  380 TIME=0:REPEATUNTILTIME>300
  390 ENDPROC
  400 DATA36,3,34,3,32,6,29,6,30,6,36,6,
34,6,32,6
  410 DATA36,3,29,3,29,3,32,3,36,3,37,3,
```

B B+ M





```
34,6,29,9
  420 DEFFNread(P%,m%):LOCALQ%
  430 Q%=m%?(P%DIV2)
  440 IFP%AND1Q%=Q%DIV16ELSEQ%=Q%AND15
  450 =Q%
  460 DEFPROCinit:FORT%=0TO&1080STEP4
  470 T%!&1F88=T%!&5E00:NEXT:L%=&286E:S%
=0
  480 hsn%=&1F88:hs%=&2088:sc%=0:PROCmod
e(2)
  490 M%=&940:N%=&9C0:o%=&A40:s%=&AC0:FO
RY%=0TO7:FORX%=0TO11:P%=X%+Y%*12:M%?P%=8
+X%*12:N%?P%=24+18*Y%:NEXT:NEXT
  500 IFRND(-TIME-1):?&81=7
  510 IFRND(-ABSRND):ENDPROC
  520 DEFPROCs:FORT%=0TO1
  530 PRINTTAB(3,T%)CHR$(65+sc%)TAB(36,T
%)CHR$(65+sc%)
  540 PRINTTAB(T%*32,3)CHR$130"Screen"
  550 NEXT:PRINTTAB(8,3)CHR$131"Press A
TO L TO select"
  560 ENDPROC
  570 DEFPROChisc:PROCh:LOCALI%
  580 PROCs:PROCmup:PROCbel(60)
  590 PRINTTAB(0,4)FNlines:FORT%=0TO11
  600 PRINTTAB(37,6+T%)CHR$156TAB(2,6+T%
)CHR$129CHR$157CHR$135;
  610 IFT%MOD11PRINT$(hsn%+T%*20-20)STRI
NG$(30-LEN$(hsn%+T%*20-20)-LENSTR$hs%!(T
%*4-4),".");hs%!(T%*4-4);" "
  620 NEXT:PRINT''FNlines
  630 IFI%<>TRUE PROCgn
  640 PROCbel(120)
  650 PRINTTAB(6,22)CHR$136"PRESS THE SP
ACE BAR TO PLAY"
  660 REPEATQ=GET-65:IFQ>-1ANDQ<12ANDQ<>
sc%sc%=Q:PROCs
  670 UNTILQ=-33:*FX13
  680 PROCbel(100):PROCmode(2)
  690 ENDPROC
  700 DEFPROCbel(N%):LOCALT%
  710 FORT%=1TO3:SOUND1,2,N%,4:NEXT
  720 ENDPROC
  730 DEFPROCh:PROCmode(7)
  740 FORT%=0TO1:PRINTTAB(0,T%)CHR$141TA
B(10,T%)CHR$132CHR$157CHR$135"BLOCK  BRE
AKER  "CHR$156:NEXT
  750 PRINTTAB(13,2)CHR$131"By:  G.J.Key
  760 ENDPROC
  770 DEFPROCmup:LOCALs%:s%=FNsco(S%)
  780 IFs%<=hs%!36:I%=TRUE:ENDPROC
  790 I%=10:REPEAT:i%=(I%-1)*4:is%=(I%-1
```

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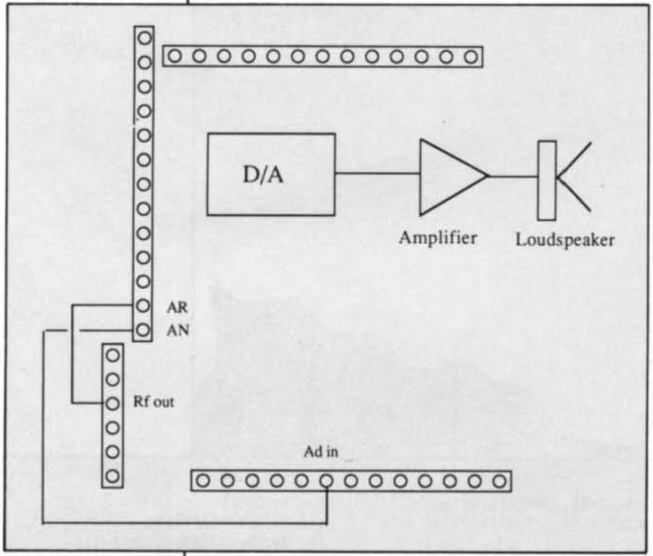
THE BEEB BODY BUILDING COURSE

Putting form into waves

Mike Cook continues his Experimenter's Board series by looking at generating sound

PAST articles have examined the VIA with its input and outputs, as well as timers, and we have seen how to control motors. Now let's turn our attention to the sound production capabilities of the Experimenter's Board. Perhaps the most universal and flexible sound chip is a digital to analogue converter – D/A. It is one of the few things I would have liked to have seen built into BBC Micros that wasn't.

Fortunately the Experimenter's Board contains one and it is a simple job to connect it up to the on-board amplifier and speaker. The basic arrangement of how to link up the board is shown above – note that link one must be removed to prevent the relays from chattering.



Wiring up the Experimenter's Board

To generate an audio waveform with a D/A converter is quite simple in theory – just send to it the number corresponding to the voltage at that instant at that part of the waveform. One of the reasons why the D/A converter is not so popular in micros is that it takes a lot of feeding – you have to send information to it at a very fast rate.

In contrast, the normal sound chip is operated by simply sending a few numbers telling it what note to play. Using a D/A converter you have to specify every part of the waveform, a task we can perform in two ways, by calculation or by look up table.

The problem with calculating a waveform as you go along is that you have not got very long to do it, so you are limited to simple ones like a sawtooth where we can calculate the next point by simply adding one to the previous point. This produces a steady rise in the output voltage of the D/A converter until the number reaches 255, when adding one produces zero because we are expressing the number in eight bit binary form. Hence the voltage drops from the maximum to zero. Listing I shows how this can be done in Basic and the first three lines of Listing II show the same thing in Forth.

```
 10 PRINT"BEEB BODY BUILDING COURSE"
 20 PRINT"APRIL 1989"
 30 PRINT"By Mike Cook"
 40 PRINT
 50 PRINT"Simple Sawtooth"
 60 REPEAT
 70 FOR A%=0 TO 255 STEP 8
 80 ?&FE61=A%
 90 NEXT
100 UNTIL INKEY(-99)
110 END
```

Listing I: A simple sawtooth from Basic

```
SCR # 7       7 H
 0 ( SIMPLE SAWTOOTH )
 1 : TASK ;  HEX
 2 : 1CYCLE 255 0 DO I FE61 C! 8 +LOOP ;
 3 : SAW1 BEGIN 1CYCLE -63 ?KEY UNTIL ;
 4
 5 CODE FAST.C      0 # LDA,
 6 BEGIN, FE61 STA, CLC, 1 # ADC,
 7 0= UNTIL, FE61 STA,  NEXT JMP,
 8 END-CODE
 9 : SAW2 BEGIN FAST.C -63 ?KEY UFTIL ;
10
11
12 DECIMAL
13
14
15
```

Listing II: The Forth version of a simple sawtooth

The listings are so simple as to be self explanatory – each produces a sawtooth wave until the spacebar is pressed. Such is the speed needed for generating an audio waveform that both languages produce nothing more than rapid clicks even when we are adding, not one to our voltage each time but eight. If we could perform the operations faster we could get more cycles of the waveform and so the note would be higher. We really need to resort to machine code.

Fortunately it is easy to incorporate machine code portions into both Basic and Forth, as both have built-in assemblers. Both programs produce one cycle of the waveform in machine code and decide whether to produce another in high level language.

The **FORTH** words for this are on lines 5 to 9. Instead of starting with the familiar : the definition starts with the word CODE. This puts the system into the assembler mode and drops the machine code instructions directly into the dictionary entry currently being created.

```
 10 PRINT"BEEB BODY BUILDING COURSE"
 20 PRINT"APRIL 1989"
 30 PRINT"By Mike Cook"
 40 PRINT
 50 PRINT"Sawtooth from Machine Code"
 60 PRINT
 70 PRINT"SPACE BAR TO STOP"
 80 DIM CODE% 20
 90 PROC_ICODE
100 REPEAT
110 CALL CODE%
120 UNTIL INKEY(-99)
130 END
140 DEF PROC_ICODE
150 FOR A%=0 TO 2 STEP 3
160 P%=CODE%
170 [
180 OPT A%
190 LDA #0 \ CLEAR A
200 .LOOP
210 STA &FE61 \ OUTPUT VALUE
220 CLC
230 ADC #1 \ ADD ONE TO THE WAVEFORM
240 BNE LOOP \ ROUND AGAIN
250 STA &FE61 \ OUTPUT LAST ZERO
260 RTS
270 ]
280 NEXT
290 ENDPROC
```

Listing III: The machine code sawtooth

The first thing to notice is that all assembler mnemonics end in a comma so there is no confusion between them and hex values or other words. In addition, in true Forth manner, the whole syntax is reversed.

One of the advantages of a Forth assembler is that the high level conditional structures are still available and these get translated into machine code instructions too.

All Forth words must end with a jump to a label called NEXT and the END-CODE finishes the word off. Note, however, the symbol between the END and the CODE is a minus sign and not the more conventional underscore character – on a Mode 7 screen they look very much the same.

The **BASIC** program (shown in Listing III) is more or less what we had before but inside the REPEAT ... UNTIL structure we have a call to a machine code routine. Before this can be called, however, it has to be assembled and this is done by placing the mnemonics in a FOR ... NEXT loop and calling up the assembler with the square brackets.

The code simply clears out the accumulator, sends it to the D/A converter, increments this value and loops back if we have not yet reached zero. Finally we output the zero value and get back to Basic with a return from subroutine instruction.

We have to place this machine code somewhere, so line 80 reserves space with the start address is given in the variable CODE%.

Formula	Result
SIN(T)	Simple sine wave
T	Sawtooth wave
SIN(T*T)	A squegger
SIN(T)*SIN(T*14)	Modulated wave
SIN(T+PI*SIN(T))	Silly waveform
SIN(T)+0.5*SIN(T*2)	Fundamental and second harmonic
SIN(T)+0.3*SIN(T*3)	Fundamental and third harmonic

Formula to try in Listing IV

Both programs produce a much higher tone, but it is still rasping – we are limited by the high level languages taking too long before generating the next waveform. What we want to do is to implement the whole tone generation in machine code, so let's look at the other way of generating a waveform – a look-up table.

This is simply a block of memory containing the numbers we are going to send to the D/A converter. We can take all the time we want calculating these numbers, because when we come to play the waveform all we need to do is to transfer a number from memory to the VIA. As the speed with which we do this will determine the frequency of the tone, we will control this by one of the two timers. Then we can use the other to determine the length of the note.

As Basic is better at producing large quantities of machine code, I will confine my example to that language. Also Basic has the ability to evaluate a string as a mathematical expression which, as we shall see, can be quite useful. Therefore we will fill up our lookup table in Basic and generate the waveform in machine code.

The program is shown in Listing IV and when you run it you will be asked to enter a formula defining the waveform. The variable *T* is used to denote time, it ranges from zero to 2π and you can apply all sorts of functions to it.

If you are not sure what to do, try the formulae listed in the table above. The program then calculates each point and draws the resulting waveform on the screen. If the waveform goes off the display don't worry, as when the plotting of all 256 points has finished it will be scaled and re-plotted. Then the word PLAY will appear on the screen and pressing any number will produce a waveform of different pitch. Pressing L allows you to enter a number between 1 and 255 to

Turn to Page 50 ▶

The Body Build Experimenter's Board was first described in the August 88 Micro User and enables you to learn about interfacing in a relatively painless way. It contains many components which can be interlinked to enable a wide variety of experiments to be performed.

◀ From Page 49

determine the length of each note. To define a different waveform press D.

The program has comments in the machine code portion so you should be able to follow it. This program shows the limitations in the small size of loudspeaker used on the Experimenter's board: You can get a real improvement in the sound quality if you feed it to a hi-fi amplifier and speaker. Notice that the sound is different with different waveforms but it does not sound as different as the waveforms look. Most real sounds are complex waveforms that change their shape as the sound progresses, and we will be looking at how to do that next month.

Listing IV: Waveform generator

```
   10 DIM W(255),CODE% &100
   20 PROC_INCODE
   30 MODE 1
   40 REPEAT
   50 PRINT
   60 PRINT"BEEB BODY BUILDING COURSE"
   70 PRINT"APRIL 1989"
   80 PRINT"By Mike Cook"
   90 PRINT
  100 PRINT"Audio waveform generator"
  110 PRINT"Using the Experimenters Boar
d"
  120 PRINT
  130 PRINT"Once you have defined a wave
form"
  140 PRINT"You can play it by pressing
keys 1 - 9"
  150 PRINT
  160 PRINT"L - Will set the length of t
one"
  170 PRINT"D - Allows you to define the
 waveform"
  180 REPEAT
  190 PRINT
  200 PROC_EVAL
  210 PROC_WTRANS
  220 PRINTTAB(33,1)"PLAY"
  230 L%=20
  240 REPEAT
  250 F=GET
  260 IF F>&2F AND F<&3A THEN PROC_PLAY(
F,L%)
  270 IF F=ASC("L") THEN PRINT TAB(33,4)
;"LENGTH":PRINT TAB(34,5);:INPUT,L%
  280 PRINT TAB(33,4);SPC(6)
  290 PRINT TAB(34,5);SPC(5)
  300 UNTIL F=ASC("D")
  310 CLS
  320 UNTIL FALSE
  330 END
  340 DEF PROC_PLAY(P,DUR%)
  350 A%=DUR%
  360 IF P=&30 THEN P=&3A
  370 X%=P-&30+14
  380 Y%=0
  390 CALL PNOTE
  400 ENDPROC
  410 DEF PROC_EVAL
  420 PRINT
  430 PRINT"Input the waveform expressio
n"
  440 PRINT"In the form:-"
  450 PRINT
  460 PRINT"SIN(T)+0.3*SIN(T*3) ..... Ec
t."
  470 PRINT
  480 INPUT W$
  490 PROC_AXIS
  500 MAX=0
  510 MIN=1024
  520 C%=0
  530 FOR T=0 TO PI*2 STEP PI*2/256
  540 B=511+511*(EVAL(W$))
  550 W(C%)=B
  560 PLOT 5,C%*4,B
  570 IF MAX<B THEN MAX=B
  580 IF MIN>B THEN MIN=B
  590 C%=C%+1
  600 NEXT
  610 IF MAX > 1023 OR MIN < 0 THEN PROC
_SCALE
  620 ENDPROC
  630 DEF PROC_SCALE
  640 PROC_AXIS
  650 ADD=0-MIN
  660 SCALE=(MAX+ADD)/1024
  670 FOR A%=0 TO 255
  680 W(A%)=(W(A%)+ADD)/SCALE
  690 IF W(A%)=1024 THEN W(A%)=1023
  700 IF A%=0 THEN MOVE 0,W(A%) ELSE PLO
T 5,A%*4,W(A%)
  710 NEXT
  720 ENDPROC
  730 DEF PROC_AXIS
  740 CLS
  750 MOVE 1024,512
  760 PLOT 21,0,512
  770 ENDPROC
  780 DEF PROC_DISP
  790 GCOL 0,3
  800 PROC_AXIS
  810 MOVE 0,W(0)
  820 FOR A%=1 TO 255
  830 DRAW A%*4,W(A%)
  840 NEXT
  850 ENDPROC
  860 DEF PROC_WTRANS
  870 FOR A%=0 TO 255
  880 A%?&A00=W(A%) DIV 4
  890 NEXT
  900 ENDPROC
  910 DEF PROC_INCODE
  920 FOR A%=0 TO 2 STEP 2
  930 P%=CODE%
  940 [
  950 OPT A%
  960 .PNOTE \ ACC A IS TIME X AND Y IS
THE TIME BETWEEN SAMPLES
  970 SEI \ DISABLE INTERRUPTS FROM SYST
EM
  980 STA &70 \STORE NUMBER OF T2 TIMEOU
TS
  990 LDA #&E0
 1000 STA &FE6E \ ENABLE THE TWO TIMERS
 1010 LDA #&FF
 1020 STA &FE68
 1030 LDA #&40
 1040 STA &FE69 \ SET UP TIMER 2
 1050 STX &FE66 \LOW ORDER BYTE
 1060 STY &FE67 \HIGH ORDER BYTE
 1070 STX &FE64
 1080 STY &FE65 \START TIMER T1
 1090 LDX #0
 1100 .LOOP
 1110 LDA &FE6D \LOOK AT THE INTERRUPT R
EG
 1120 BPL LOOP \BRANCH IF NO TIME OUT YE
T
 1130 LDA &A00,X \GET NEXT SAMPLE OF THE
 WAVEFORM
 1140 STA &FE61 \OUTPUT IT TO THE D/A CO
NVERTER
 1150 INX
 1160 LDA &FE64 \RESET INTERRUPT FLAG WI
TH A READ
 1170 LDA &FE6D \LOOK AT THE INTERRUPT R
EG
 1180 BPL LOOP \BRANCH IF T2 HAS NOT TIM
E OUT
 1190 LDA #&7F
 1200 STA &FE6D \RESET ALL INTERRUPT FLA
GS
 1210 LDA #&FF
 1220 STA &FE68 \RE PRIME TIMER 2
 1230 LDA #&40
 1240 STA &FE69
 1250 DEC &70 \TAKE ONE OFF THE NUMBER O
F T2 TIMEOUTS
 1260 BNE LOOP \ BACK IF WE HAVE NOT FIN
ISHED
 1270 LDA #&60
 1280 STA &FE6E \ DISABLE THE TWO TIMERS
 1290 LDA #123
 1300 STA &FC20
 1310 CLI \ ENABLE SYSTEM INTERRUPTS
 1320 RTS
 1330 ]
 1340 NEXT
 1350 ?&FE62=&FF : REM SET UP VIA AS ALL
OUTPUTS
 1360 ?&FE6B=&40 :REM SET UP TIMER MODES
 1370 ENDPROC
```

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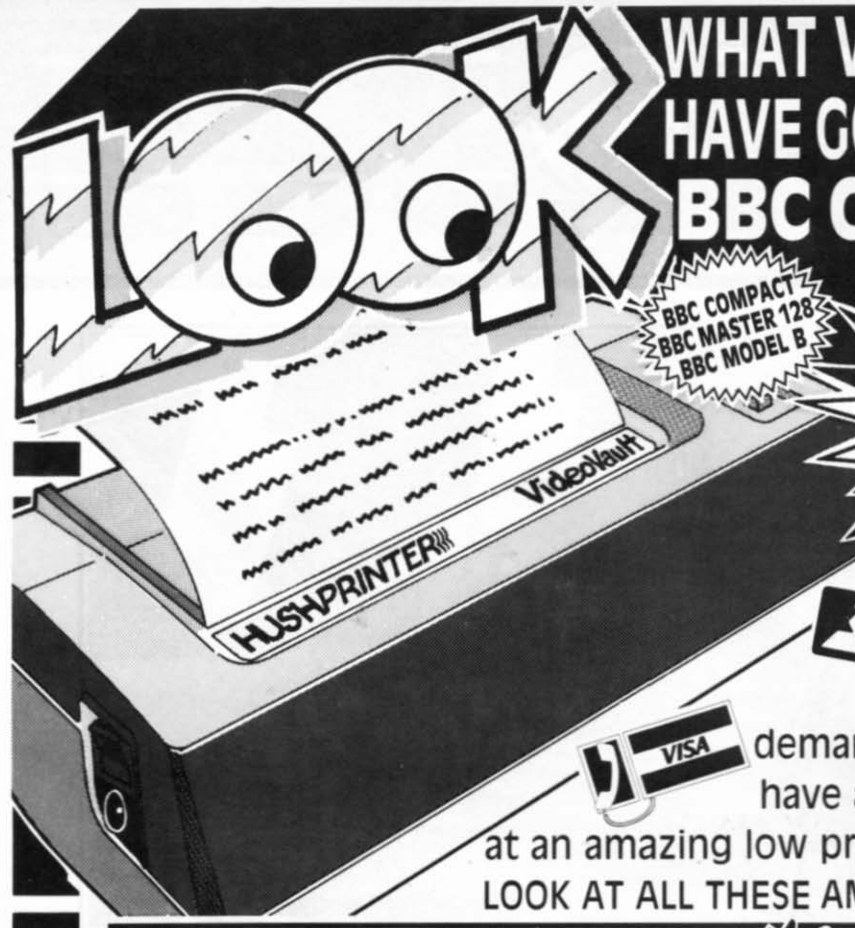

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BBC MICRO
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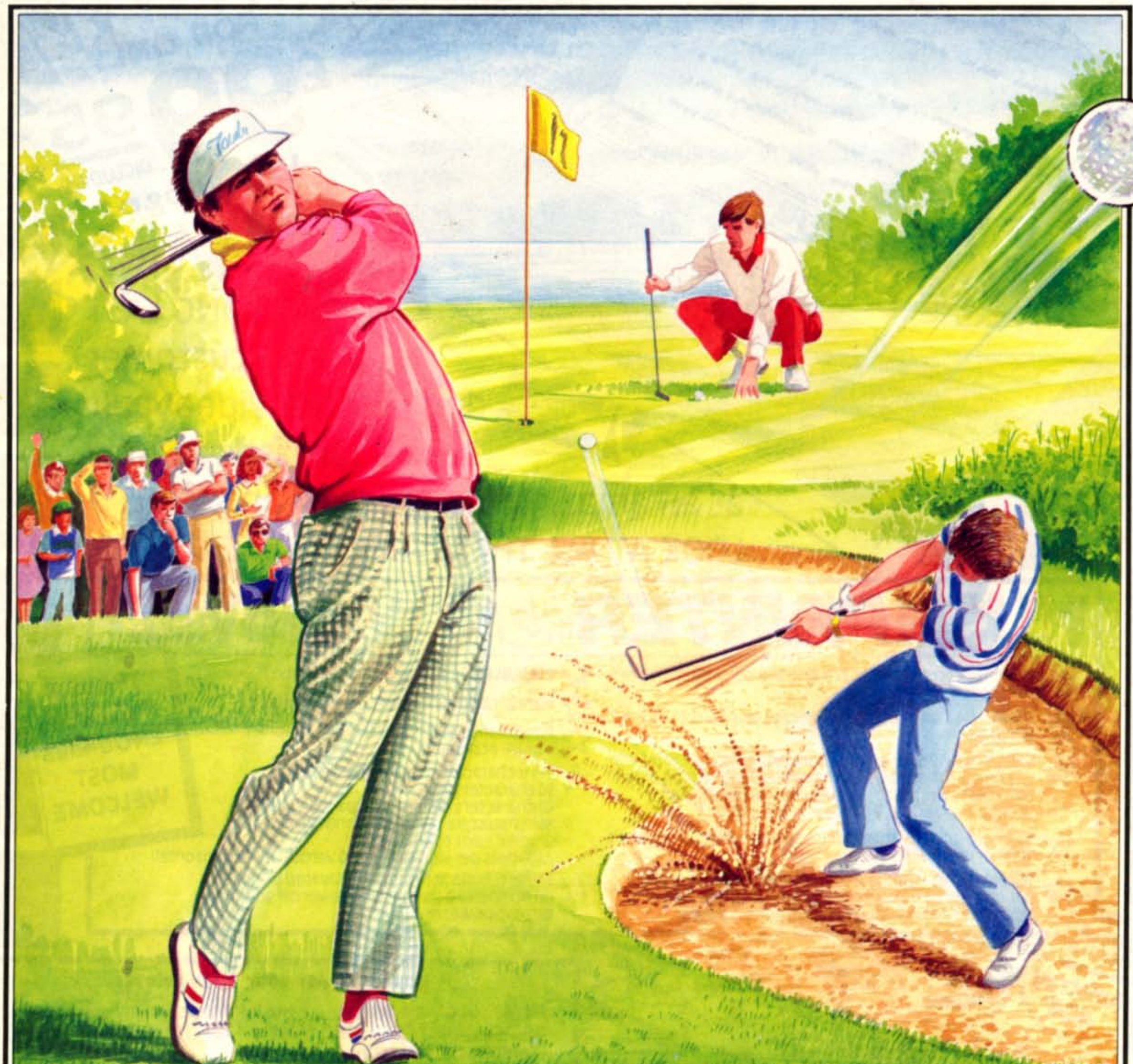
Holed



The Fourth Dimension

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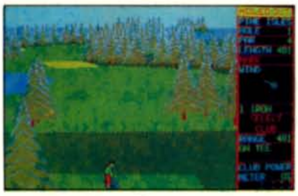
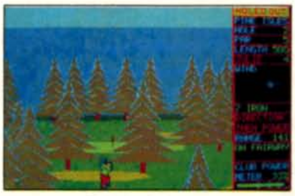
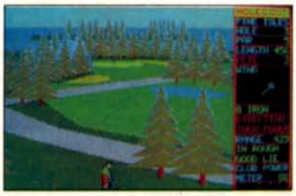
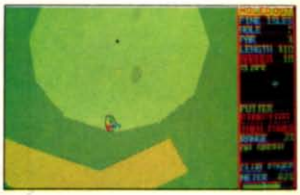
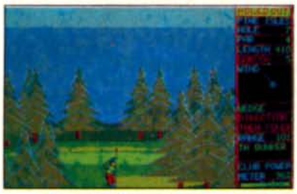
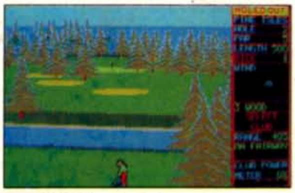

Driving off the 1st tee - a dogleg to the right.

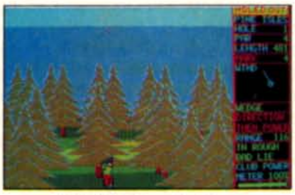

Using a 7 Iron to clear the trees.

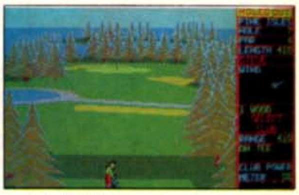

A good lie in the rough but there's a strong wind.


A long put with a tricky slope to the left.


A long bunker shot soars through the air to the green.


A left-handed player aims to clear the canal with a 3 Wood.


A high Wedge shot from a bad lie in the rough.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The Fourth Dimension

Playing tag

Concluding his series on sorting, Peter Vasey shows you how to extend his techniques to databases

WE looked last month at three separate machine code sort routines, one for each type of variable – integer, real and string. Now we'll see how they can be combined into a single block of code which detects the type of variable to be sorted and proceeds accordingly. Then we'll look at a modified version for use within a database program.

Program I is a combination of the three types of sort. When data is passed to the Basic CALL command both the address and type of variable are included – the sort routine uses this information to select the right sort. The new variables, *bytes* and *type*, keep track of these. The actual sorting is the same as that used last month, but there is additional code to ensure that null strings go to the bottom of the list whether the sort is ascending or descending.

Although this program contains a lot of code similar to the earlier ones its presentation is quite different. The line numbers may seem strange, but we'll be using this program as the base on which to build the database sort routine.

The assembled code takes up a total of 537 – &219 – bytes of memory. Unfortunately this is too much to put in pages 9 and A which are normally free, but since the routine is completely relocatable you can put it in an area of memory reserved with DIM like this:

```
DIM SORT &219,X%-1:Y%=X%DIV256
$X%="LOAD CODE "+STR$~SORT:CALL&FFF7
```

You then call the code as before, for example:

```
?&80=0:?&88=1:CALL SORT,N%,A$(1)
```

Address &80 is the direction flag, set to 0 for ascending sorts and 1 for descending. Setting &88 to 1 forces lower case and upper case letters

Program I

```
   20 REM MACHINE CODE SHELL SORT
   40 REM ALL ARRAYS
   60 REM By Peter Vasey
   80 REM (C) The Micro User
  100 :
  120 MODE7:VDU14:PROCassem
  140 DIMA%(10),A(10),A$(10),D$(1):D$(0)
="A":D$(1)="DE"
  160 N%=10:FORL%=0TO1:RESTORE
  180 FORI%=1TO10:READA$(I%)
  200 A%(I%)=RND(5000)-2500:A(I%)=(RND(5
000)-2500)/RND(100):NEXT
  220 A(RND(N%))=0:?dirn=L%:IFL%=0 PRINT
"READY - Hit a key (SHIFT to scroll)":A%
=GET
  240 PRINT'"NUMBERS, "D$(L%)"SCENDING O
RDER"
  260 CALLSORT,N%,A%(1):CALLSORT,N%,A(1)
  280 PRINTTAB(4)"INTEGERS     REALS"
  300 FORI%=1TO10:PRINTA%(I%),"    "A(I%)
:NEXT
  320 FORK%=0TO1:?caps=K%
  340 PRINT'"STRINGS "D$(L%)"SCENDING OR
DER"
  360 IF?caps=1 PRINT"Treating lower cas
e as upper"
  380 CALLSORT,N%,A$(1)
  400 FORI%=1TO10:PRINTA$(I%):NEXT
  420 NEXT:NEXT
  440 :
  460 END
  480 DATAAnne,DAVIDSON,"",COLIN,alan,""
,Peter,smythe,SMITH,david
  500 :
  520 :
  540 :
  560 DEFPROCassem
  580 params=&600:varptr=&604
  600 count=&70:gap=&72:items=&74
  620 g=&76:j=&78:k=&7A
  640 jptr=&7C:gptr=&7E
  660 dirn=&80:swapflag=&81
  664 jlen=&82:glen=&83
  666 jaddress=&84:gaddress=&86
  668 caps=&88:temp=&89
  670 gexp=&84:gmanthi=&85:jsign=&8A
  675 type=&606:bytes=&8B
  680 :
  700 FORN%=0TO2STEP2
  720 P%=&1100:REM FOR DISC USERS
  740 [OPTN%
  760 .SORT
  780 LDAparams:CMP#2:BNEbad
  800 LDAparams+3:CMP#4:BNEbad
  820 LDAparams+6:CMP#4:BEQgood
  825 CMP#5:BEQgood
  835 CMP#&81:BNEbad:LDA#4:BNEgood
  840 .bad BRK
  860 ]
  880 $P%=CHR$255+"Bad CALL"+CHR$7
  900 P%=P%+10
  920 [OPTN%
  940 BRK
  960 .nosort RTS
  980 .good STAbytes:LDAparams+1:STA&70:
LDAparams+2:STA&71
 1000 LDY#0:STYgap+1:LDA(&70),Y:STAitems
 1020 INY:STYgap:LDA(&70),Y:STAitems+1
 1040 BMI bad:BNErepeat1:LDXitems:BEQnos
ort:DEX:BEQnosort
 1060 .repeat1
 1080 ASLgap:ROLgap+1
 1120 LDAitems:CMPgap
 1140 LDAitems+1:SBCgap+1:BCSrepeat1
 1160 LDAgap:SBC#1:STAgap:BCSrepeat2:DEC
gap+1
 1180 .repeat2
 1200 LSRgap+1:RORgap
 1220 LDX#0:STXk:STXk+1
 1240 SEC:LDAitems:SBCgap:STAcount:LDAit
ems+1:SBCgap+1:STAcount+1
 1260 .for LDAk:STAj:LDAk+1:ASLj:ROLA:AS
Lj:ROLA:STAj+1
 1265 LDAbytes:CMP#5:BNErepeat3
 1275 CLC:LDAk:ADCj:STAj:LDAk+1:ADCj+1:S
TAj+1
 1280 .repeat3 LDAgap:STAg:LDAgap+1:ASLg
:ROLA:ASLg:ROLA:STAg+1
 1285 LDAbytes:CMP#5:BNEnot5
 1290 .repeat2link BNErepeat2
 1295 CLC:LDAgap:ADCg:STAg:LDAgap+1:ADCg
+1:STAg+1
 1300 .not5 CLC:LDAg:ADCj:STAg:LDAg+1:AD
Cj+1:STAg+1
 1320 CLC:LDAvarptr:ADCj:STAjptr:LDAvarp
tr+1:ADCj+1:STAjptr+1
 1340 CLC:LDAvarptr:ADCg:STAgptr:LDAvarp
tr+1:ADCg+1:STAgptr+1
 1360 LDY#0
 1380 .forlink BNEfor
 1400 :
 1420 BEQcompare
 1440 .comeback LDAswapflag:BEQnext:LDYb
ytes:DEY
 1460 .loop2 LDA(jptr),Y:PHA:LDA(gptr),Y
:STA(jptr),Y
 1480 PLA:STA(gptr),Y:DEY:BPLloop2
 1500 SEC:LDAj:SBCbytes:STAj:LDAj+1:SBC#
0:STAj+1
 1520 BPLrepeat3
 1540 .next INCk:BNEon:INCk+1
 1560 .on LDAk:CMPcount:BNEforlink
 1580 LDAk+1:CMPcount+1:BNEforlink
 1600 LDAgap+1:BNErepeat2link
 1620 LDXgap:DEX:BNErepeat2link
 1640 RTS
 1660 :
 1680 .compare STYswapflag:LDXdirn:BEQwh
ichtype:LDX#1
 1700 .ptloop LDAjptr,X:PHA:LDAgptr,X:ST
Ajptr,X
 1720 PLA:STAgptr,X:DEX:BPLptloop
```

speeds sorts

to be treated the same – for normal comparisons use zero. You must always set these flags before calling the code, otherwise you might get the wrong version of sort.

So far we have been dealing with Basic arrays of different kinds of variable. This is fine if that's all you need to do and the code will cater for more variables than you can hold in memory. But you are limited to only one array at a time – there is no way you can use the result of sorting one array to influence another.

Now one of the more frequent uses of sorting is in databases, where you may have several items of information linked together and you may want to sort on different fields. For example if you have a personnel file, you might want to sort on name or age or even height. But rearranging the name field on its own is no earthly use, since the rest of the information will then be jumbled up. You have to swap not only the field on which you are sorting, but also all the related fields. This leads to a very convoluted program even in Basic, and also slows the sort considerably.

A far more efficient method is to examine the appropriate field but swap a separate pointer array. Look at the following pseudo-Basic lines:

```
DIM A%(100)
FOR I%=1TO100:A%(I%)=RND:NEXT
REPEAT
  Calculate J% and G%
  IF A%(J%)>A%(G%) THEN PROCswap
  UNTIL Sort completed
DEF PROCswap:Swap A%(J%) with A%(G%)
```

This is the essential core of sorting individual arrays – missing out the calculation of *J%* and *G%*. Now consider this:

```
DIM A%(100),P%(100)
FORI%=1TO100:A%(I%)=RND:P%(I%)=I%:NEXT
REPEAT
  Calculate J% and G%
  IF A%(P%(J%))>A%(P%(G%)) THEN PROCSWAP
  UNTIL Sort completed
DEF PROCSWAP:Swap P%(J%) with P%(G%)
```

In this case we have not swapped the actual

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```
 1730 .whichtype LDXtype:CPX#4:BNEreal
 1740 .integer SEC
 1760 .loop LDA(gptr),Y:SBC(jptr),Y
 1780 INY:DEX:BNEloop:BVCnoov:EOR#&80
 1800 .noov EOR#0:BPLcomeback
 1820 INCswapflag
 1830 .link CLC:BCCcomeback
 1840 .real CPX#5:BNEstring:INY
 1850 :
 1860 LDA(jptr),Y:AND#&80:STAjsign
 1880 LDA(gptr),Y:AND#&80:DEY
 1900 CMPjsign:BEQcompexp:BCSswap:BCClin
k
 1940 .compexp
 1960 LDA(jptr),Y:CMP(gptr),Y:BNEnot
 2000 .compmant INY:LDA(gptr),Y:AND#&7F:
STAgmanthi
 2020 LDA(jptr),Y:AND#&7F:CMPgmanthi:BNE
not
 2040 LDX#3
 2060 .rloop2 INY:LDA(jptr),Y:CMP(gptr),
Y:BNEnot
 2080 DEX:BNErloop2:BEQlink
 2100 .not BCSJsig0
 2120 .Jsig80 BITjsign:BPLlink
 2130 .swap INCswapflag:BNElink
 2140 .Jsig0 BITjsign:BPLswap
 2160 .blink CLC:BCClink
 2170 .nullswap1 LDAdirn:BNElink:BEQswap
 2175 .nullswap2 LDAdirn:BEQlink:BNEswap
 2180 .string LDY#3:LDA(gptr),Y:STAglen:
LDA(jptr),Y:STAjlen
 2200 BNEnotnull:ORAglen:BEQlink:BNEnull
swap1
 2220 .notnull LDAglen:BEQnullswap2:LDY#
1
 2240 .addrloop LDA(jptr),Y:STAjaddress,
Y
 2260 LDA(gptr),Y:STAgaddress,Y:DEY:BPLa
ddrloop:INY
 2280 .sloop LDA(gaddress),Y:LDXcaps:BEQ
nochange1
 2300 CMP#97:BCCnochange1:CMP#123:BCSnoc
hange1:AND#223
 2320 .nochange1 STAtemp:LDA(jaddress),Y
:LDXcaps:BEQnochange2
 2340 CMP#97:BCCnochange2:CMP#123:BCSnoc
hange2:AND#223
 2360 .nochange2 CMPtemp:BCCblink:BNEswa
p
 2380 INY:CPYjlen:BEQblink:CPYglen:BNEsl
oop:BEQswap
 2400 ]
 2420 NEXT
 2440 ENDPROC
```

Get it right!

```
                              825 = 3396 7   1340 =  6E2 A   1900 = F19A B
                              835 = 28D6 7   1360 = 9B97 4   1940 = E1D5 9
                              840 = 6913 B   1380 = A912 C   1960 = 6B6A 3
                              860 = 8B58 8   1400 = 9719 5   2000 = C1A6 8
                              880 = 5039 B   1420 = 7D01 9   2020 = 8789 2
                              900 = 5503 8   1440 = FA83 5   2040 = 9CC4 2
                              920 = 6A96 8   1460 = 9162 2   2060 = A620 C
                              940 = E2BF 7   1480 = 3BCD D   2080 = 930B 4
 20 =    0 0   480 = 3456 8   960 = 5F49 6   1500 = 7346 E   2100 = 57EC A
 40 =    0 0   500 = 9719 5   980 = 9C9C 3   1520 = 29AC 1   2120 =  F97 4
 60 =    0 0   520 = 9719 8  1000 = 4600 3   1540 = B45D 5   2130 = 6505 0
 80 =    0 0   540 = 9719 F  1020 = 48C0 9   1560 = CEFE 0   2140 = D189 2
100 = 9719 9   560 = 1330 3  1040 =  E36 B   1580 = 7747 8   2160 = 8303 F
120 = 17B3 2   580 = 356B 4  1060 = AB47 A   1600 = B5FA E   2170 = E205 F
140 =  452 B   600 = B8FC C  1080 = FE53 4   1620 = AC80 5   2175 = 17F6 0
160 = 2819 E   620 = 3C60 7  1120 = 5ADA 1   1640 = 9843 B   2180 = 273C 6
180 = A998 8   640 = 8574 0  1140 = B764 9   1660 = 9719 C   2200 = B0BE F
200 = 2CAE C   660 = AAF9 9  1160 = AD44 5   1680 = 990C E   2220 = 216C D
220 = 9104 0   664 = 87BB 4  1180 = 9B24 E   1700 = 7290 A   2240 = 3AAC E
240 = 6384 5   666 = 1098 B  1200 = 2591 E   1720 =  A10 D   2260 = 52FE B
260 = 4A84 9   668 = D490 2  1220 = 2F49 2   1730 = CF15 2   2280 = 3520 4
280 = D057 C   670 = CE85 5  1240 = 1279 2   1740 = 3F83 D   2300 = C53F C
300 = F13D 4   675 = A92D 5  1260 = 71E9 C   1760 = A026 9   2320 = C139 F
320 = F3E9 6   680 = 9719 D  1265 = DB13 6   1780 = E29E 9   2340 = 7001 4
340 = C52B 3   700 = 2395 4  1275 = 8E14 9   1800 = 5D78 E   2360 = 3089 0
360 = 7B59 C   720 = 9F54 8  1280 = BEA8 2   1820 = 5118 8   2380 = BF0C 7
380 = BF48 4   740 = 6A96 1  1285 = 94BF F   1830 =  60A F   2400 = 8B58 6
400 = A5ED 4   760 = 6ACB F  1290 = 272B 1   1840 =  A00 C   2420 = 2C83 2
420 = 24BD E   780 = F89C A  1295 = 1315 A   1850 = 9719 1   2440 = ED0F C
440 = 9719 C   800 =  D95 9  1300 = B65B B   1860 = 523D 9
460 = FD2E 4   820 = 6881 B  1320 = A514 6   1880 = E051 E
```

Program II

```
   10 MODE7:DIMA%(10),A$(10),P%(10)
   20 N%=9
   30 FORI%=1TON%:READA%(I%),A$(I%):P%(I%)=I%
:NEXT
   40 PROCsort
   50 PRINTSPC9"I%"SPC6"P%(I%)"SPC3"A%(P%) A$
(P%)"
   60 FORI%=1TON%:PRINTI%,P%(I%),A%(P%(I%)),"
 "A$(P%(I%)):NEXT
   70 END
   80 DATA5,FIVE,3,THREE,7,SEVEN,6,SIX,9,NINE
,4,FOUR,1,ONE,2,TWO,8,EIGHT
   90 DEFPROCsort
  100 gap%=1
  110 REPEATgap%=gap%+gap%
  120 UNTILgap%>N%:gap%=gap%-1
  130 REPEATgap%=gap%DIV2
  140 FORK%=1TON%-gap%:J%=K%
  150 REPEATG%=J%+gap%
  160 IFA%(P%(J%))>A%(P%(G%)) T%=P%(J%):P%(J%
)=P%(G%):P%(G%)=T% ELSEJ%=1
  170 J%=J%-1:UNTILJ%=0
  180 NEXT:UNTILgap%=1
  190 ENDPROC
```

Get it right!

```
                              110 = A3FE 3
                              120 = 3062 C
                              130 = DD55 B
                              140 = 6925 D
 10 = 9E2D D    60 = 27A2 3   150 = 7184 C
 20 = 7543 1    70 = FD2E 9   160 = 37D8 D
 30 = D5C6 4    80 = 83B4 3   170 =  CB8 3
 40 = 450E F    90 = AFF9 7   180 = 55BA 6
 50 = 10FD A   100 = 5E2C C   190 = ED0F F
```

◀ From Page 55

array we are comparing, but only the pointer array. We can then use the sorted pointer array to look at any item in the database.

We can sort again on a different field without resetting the pointer array and still have the appropriate swaps taking place. It is, however, essential that the elements numbered in the pointer array correspond exactly to the fields in use, so if you add or subtract any blocks from the database you must then reset the pointer array to suit.

Program II is a modified version of Phil Bender's Basic shell sort from the November 1988 issue of *The Micro User* which demonstrates the use of a pointer array, sorting on one field and listing two arrays. If you examine the program you will see that neither of the original arrays are being disturbed, only the pointer array is swapped.

This method of pointer or tag sorting is very similar to that used on string arrays. The main difference is that the string array pointers contain the actual address of the strings in ram, whereas our tag array contains the element numbers of the array being compared. This has to be taken into account when writing the machine code.

Now we come to the application of tag sorting to our machine code program. The first thing to be considered is how many elements to allow. If we go for the same number as before we need to use a four-byte tag array for easy access from Basic. This rapidly eats into memory – a 1000 entry database will require 4000 bytes for the tags alone. Which limits the size of the database. While a two-byte tag field will save some memory,

Program III

```
   40 REM ALL ARRAYS, WITH POINTER
  140 DIMA%(255),A$(1,255),S(255),P%255,D$(1)
:D$(0)="A":D$(1)="DE"
  160 PRINT"ASCENDING ORDER, CHECKING LOWER
CASE"
  180 FORI%=1TO10:READA$(0,I%),A$(1,I%),A%(I%
),S(I%):P%?I%=I%:NEXT
  200 N%=10:FORL%=0TO1
  220 IFL%=0 PRINT"READY - Hit a key (SHIFT t
o scroll)":A%=GET
  240 ?dirn=0:?caps=1
  260 IFL%=0:PRINT"SORTING ON NAMES":ELSEPR
INT"SORTING ON PLACES"
  280 CALLSORT,N%,A$(L%,0),P%?1:PROCLIST
  300 NEXT
  320 PRINT"SORTING ON AGES"
  340 CALLSORT,N%,A%(0),P%?1:PROCLIST
  360 PRINT"SORTING ON HEIGHTS (DESCENDING O
RDER)"
  380 ?&80=1:CALLSORT,N%,S(0),P%?1:PROCLIST
  400 END
  420 DEFPROCLIST
  440 FORI%=1TO10:PRINTA$(0,P%?I%),A$(1,P%?I%
),A%(P%?I%);"  ";S(P%?I%)
  460 NEXT
  480 ENDPROC
  500 DATAFinlay,Inverness,18,1.72,DAVIDSON,L
ondon,24,1.83,Robert,Coventry,24,1.80,COLIN,N
ewcastle,17,1.77
  520 DATAalan,Birmingham,22,1.69,THOMAS,Edin
burgh,19,1.82,Peter,York,21,1.74,smythe,Brist
ol,23,1.71,SMITH,Manchester,18,1.84,david,Car
diff,23,1.73
  580 params=&600:varptr=&604:pointer=&607
  675 type=&606:jpoint=&8B:gpoint=&8D
  780 LDAparams:CMP#3:BNEbad
  810 LDAparams+9:BNEbad
  835 CMP#&81:BEQgood
  940 .toobig BRK
  941 ]
  942 $P%=CHR$255+"Too Many"+CHR$7
  943 P%=P%+10
  944 [OPTN%
  945 BRK
  980 .good LDAparams+1:STA&70:LDAparams+2:ST
A&71
 1000 LDY#1:LDA(&70),Y:BMIbad:BNEtoobig:STYga
p
 1020 DEY:LDA(&70),Y:BEQnosort:TAX:DEX:BEQnos
ort
 1040 STAitems
 1080 ASLgap
 1120 BCSgreater
 1140 LDAitems:CMPgap:BCSrepeat1
 1160 .greater DECgap
 1200 LSRgap
 1220 LDA#0:STAk
 1240 SEC:LDAitems:SBCgap:STAcount
 1260 .for LDAk:STAj
 1265 :
 1275 :
 1280 .repeat3
 1285 :
 1290 :
 1295 :
 1300 CLC:LDAgap:ADCj:STAg
 1320 CLC:LDApointer:ADCj:STAjptr:LDA#0:TAY:A
DCpointer+1:STAjptr+1
 1340 CLC:LDApointer:ADCg:STAgptr:TYA:ADCpoin
ter+1:STAgptr+1
 1350 LDA(jptr),Y:STAjpoint:TYA:ASLjpoint:ROL
A:ASLjpoint:ROLA:STAjpoint+1
 1360 LDA(gptr),Y:STAgpoint:TYA:ASLgpoint:ROL
A:ASLgpoint:ROLA:STAgpoint+1
 1361 LDAtype:CMP#5:BNEnot5
```

it will be very awkward to access from Basic, involving continual use of multipliers and DIV.

If you also consider the average size of a personal database – around 100 bytes per entry for an address book – you can see that a database of 250 entries occupies 25,000 bytes of precious memory.

So we'll use a single byte tag field. This limits the number of items to 255 – 0 to 255. The code checks to ensure that the number of items does not exceed 255. We can now use *?* to access the tag field and there is a further advantage: Despite the extra code needed to manipulate the tag field, the shorter and faster single byte arithmetic reduces the code length to 511 bytes total, so it will just squeeze into pages 9 and A.

Use of the code is again straightforward, with the addition of the tag field pointer P% to the CALL parameters. So we now have, for example:

```
?&80=0:?&81=1:CALLSORT,N%,A$(0),P%?1
```

The main array element must always be indexed at zero because it gives the start address of the array in memory needed by the tag pointer *P%*. If you use a multi-dimension array, the parameter takes the form A$(1,0) and so on. The *P%* start point – *1* in the above example – can be any point in the array for part sorting, but be careful as always not to exceed the array limits. You can use a program variable with *P%*:

```
P%?start_element
```

It is important to remember that the *P%* elements have to correspond with the array elements, so if your database uses elements 1 to 75, the *P%* values must initially be set from 1 to 75 as well.

The Program III lines should be typed in over Program I or SPOOLed then EXECuted – we have provided the checksums for the Program III only lines. On running the relocatable code for the tag sort is assembled then a sample data base of four fields – name, place, age and height – is set up.

The first two are string fields in a two dimensional array, age is integer and height is real. In many cases we can use memory saving integer arrays instead by choosing a suitable multiplier. Here if heights had been measured in centimetres instead of metres they could all have been integer – but for demonstration purposes we'll use real numbers this time.

The program sorts on each field in turn and the results speak for themselves. Using a multidimensional array is much easier than having individually named arrays which are then fixed throughout the program – with multi-dimensional ones you dimension to suit the field selection for a particular application and manipulate by reference to the array elements.

In our example the string array dimension zero is name and one is place. With only 10 items, the sort is virtually instantaneous, but even with the full complement of 255, it takes less than one second for any type of sort.

Now you have the building blocks for rapidly sorting any type of variable in your own programs. And experienced machine code programmers will be able to use the comparison routines to implement high speed searches as well.

```
 1362 CLC:LDA(jptr),Y:ADCjpoint:STAjpoint:BCC
incg:INCjpoint+1
 1363 .incg CLC:LDA(gptr),Y:ADCgpoint:STAgpoi
nt:BCCnot5:INCgpoint+1
 1380 :
 1420 :
 1430 .not5 CLC:BCCcompare
 1431 .forlink BNEfor
 1432 .repeat2link BNErepeat2
 1440 .comeback LDAswapflag:BEQnext:LDY#0
 1460 LDA(jptr),Y:PHA:LDA(gptr),Y:STA(jptr),Y
 1480 PLA:STA(gptr),Y
 1500 SEC:LDAj:SBC#1:STAj
 1520 BCSrepeat3
 1540 .next INCk
 1560 LDAk:CMPcount:BNEforlink
 1580 :
 1600 :
 1680 .compare LDAjpoint:ADCvarptr:STAjpoint:
LDAjpoint+1:ADCvarptr+1:STAjpoint+1
 1690 CLC:LDAgpoint:ADCvarptr:STAgpoint:LDAgp
oint+1:ADCvarptr+1:STAgpoint+1
 1695 STYswapflag:LDXdirn:BEQwhichtype:LDX#1
 1700 .ptloop LDAjpoint,X:PHA:LDAgpoint,X:STA
jpoint,X
 1720 PLA:STAgpoint,X:DEX:BPLptloop
 1760 .loop LDA(gpoint),Y:SBC(jpoint),Y
 1860 LDA(jpoint),Y:AND#&80:STAjsign
 1880 LDA(gpoint),Y:AND#&80:DEY
 1960 LDA(jpoint),Y:CMP(gpoint),Y:BNEnot
 2000 .compmant INY:LDA(gpoint),Y:AND#&7F:STA
gmanthi
 2020 LDA(jpoint),Y:AND#&7F:CMPgmanthi:BNEnot
 2060 .rloop2 INY:LDA(jpoint),Y:CMP(gpoint),Y
:BNEnot
 2180 .string LDY#3:LDA(gpoint),Y:STAglen:LDA
(jpoint),Y:STAjlen
 2240 .addrloop LDA(jpoint),Y:STAjaddress,Y
 2260 LDA(gpoint),Y:STAgaddress,Y:DEY:BPLaddr
loop:INY
```

Get it right!

```
  40 =    0 0
 140 = BB34 4
 160 = 6328 E
 180 = 2303 3
 200 = 6036 C
 220 = 425F D
 240 = A012 6
 260 = 5570 B
 280 = 4C1A 4
 300 = 2C83 C
 320 = 6FE5 9
 340 =  EB9 3

 360 = A883 9
 380 = 65D9 8
 400 = FD2E 9
 420 = 722D F
 440 = DED6 5
 460 = 2C83 D
 480 = ED0F 9
 500 = F843 D
 520 = F3F2 4
 580 = DA85 B
 675 = 8286 8
 780 = BF4F 4

 810 = 3B45 D
 835 = 7F56 2
 940 = D045 A
 941 = 8B58 5
 942 = A5BF E
 943 = 5503 A
 944 = 6A96 5
 945 = E2BF 2
 980 = 7376 E
1000 = 730F 7
1020 = 724B 2
1040 = 7DCD 2
1080 = AD89 2
1120 =  2B1 9
1140 = EBF4 0
1160 = 9599 F

1200 = 5A37 9
1220 = BB30 7
1240 = 3107 0
1260 = 38C4 F
1265 = 9719 0
1275 = 9719 6
1280 = 8B05 8
1285 = 9719 4
1290 = 9719 8
1295 = 9719 E
1300 = 6306 8
1320 =  A89 A
1340 = EB3F B
1350 = A01B B
1360 = B207 8
1361 = 302A 2

1362 = 6F2D 1
1363 = 6A44 3
1380 = 9719 0
1420 = 9719 3
1430 = 87C9 9
1431 = A912 2
1432 = 272B 0
1440 = DA01 4
1460 =  C68 5
1480 = B54F 9
1500 = F0C7 6
1520 = B360 4
1540 =  CFD C
1560 = 295B A
1580 = 9719 8
1600 = 9719 A

1680 = 9061 9
1690 = 61C2 F
1695 = 3DEA 9
1700 = BC21 1
1720 =  3F0 E
1760 = 7F28 8
1860 = DEAE C
1880 = FC5E D
1960 = 5F40 9
2000 = 2013 3
2020 = 856B A
2060 =  F0E C
2180 = CA66 E
2240 = 6F07 C
2260 = 55B3 6
```

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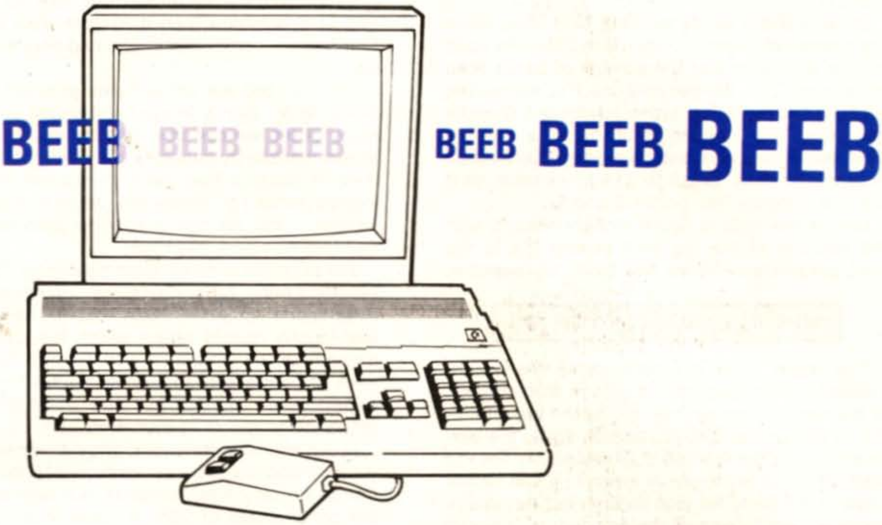
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Commodore

Calculating coordinates

If you are looking for an easy way to define windows go no further. Geoff Hawkins has the perfect answer

WINDOW codes on the Z88 were covered in the May 1988 issue of *The Micro User*. But here is a new routine designed to make life easier when calculating all those VDU codes. WINDEF takes all the work out of defining windows, just type it in to your Z88 or enter it into your BBC Micro and transfer it over.

When you run it you can select from a menu the type of border that will be displayed round your window – options one to four. You then simply define your window with the aid of the cursor keys, marking two diagonally opposite corners.

The window then fills and if you are happy with the proportions pressing Tab will append lines containing the appropriate VDU codes to the end of the program. Any other key cancels the definition. The code for calling each window is printed in REM statements following the definitions.

The process is repeated until all the five definitions allowed are used or you select option 4 to quit. Then the original part of the program is deleted, leaving the required VDU statements ready for you to build into your own work.

RESTORING THE DISPLAY

The absence of a Break key on the Z88 can be a bit of a nuisance at times. If when programming you find you have defined a window that you cannot get out of, remember that VDU1,50,67,56; returns the screen to normal. Don't forget that last semicolon.

If you have lost the cursor VDU1,67 will return it and VDU1,83 will return the screen to its scrolling mode if it has stopped.

```
   10 REM WINDEF
   20 REM FOR Z88
   30 REM by G.D.Hawkins
   40 REM (c) The Micro User
   50 L%=9100:W%=0
   60 *NAME WINDOWS
   70 ON ERROR GOTO750
   80 IF W%=7CLS:PRINT'"ALL DONE":FOR T=
1 TO 2000:NEXT:GOTO8000
   90 dir=0
  100 VDU1,83
  110 PROCstyle
  120 X=47:Y=3
  130 CLS:PRINTTAB(0,2)"Mark first corne
r."
  140 PROCdoit
  150 A=X:B=Y
  160 PRINT"+"
  170 PRINTTAB(0,2)"Mark second corner."
  180 PROCdoit
  190 C=X:D=Y
  200 PROCplot(A,B,C,D)
  210 PROCprint
  220 IF tab<>9 GOTO60
```

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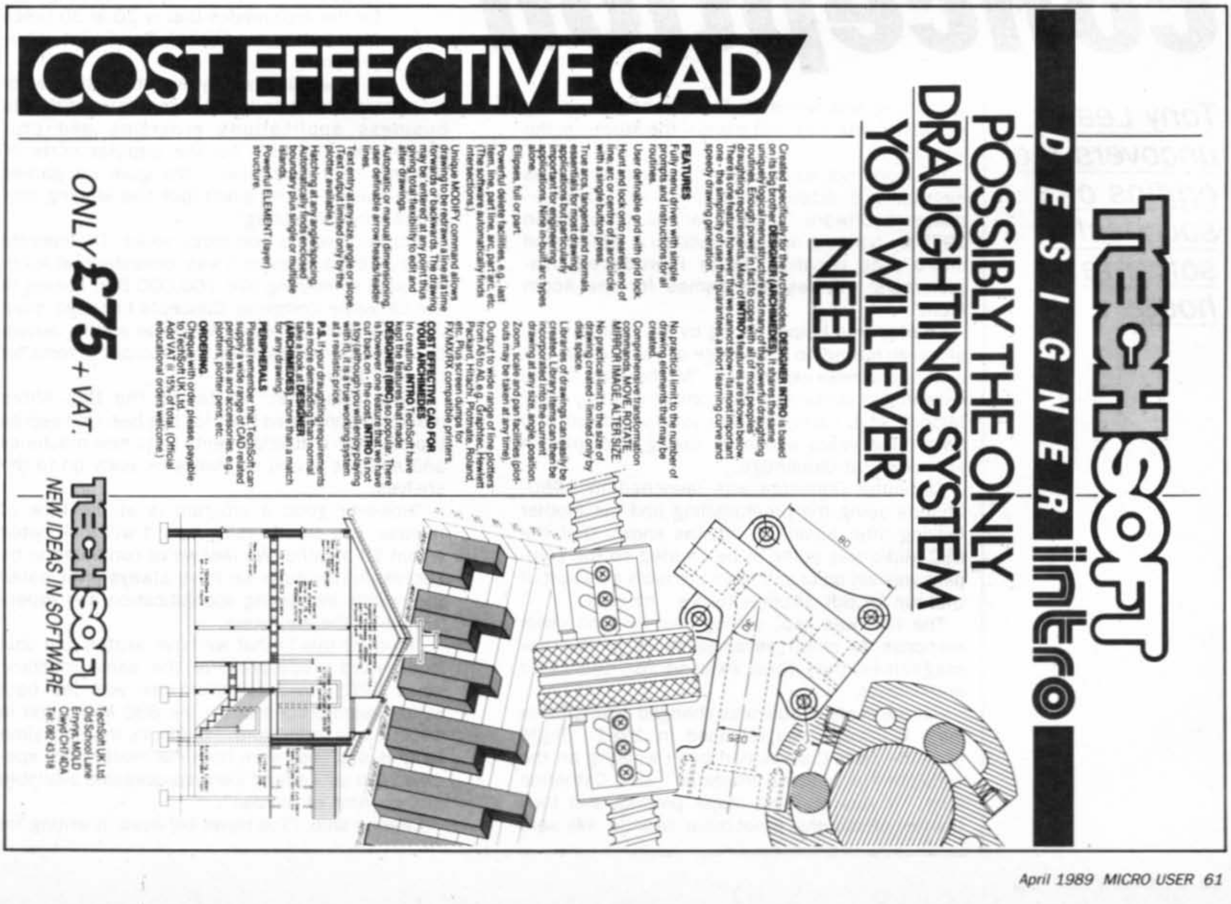
◀ *From Page 59*

```
  230 END
  240 DEFPROCmove(dir)
  250 IF dir=255 AND Y>0 Y=(Y-1)
  260 IF dir=254 AND Y<7 Y=(Y+1)
  270 IF dir=253 AND X<93 X=(X+1)
  280 IF dir=252 AND X>1 X=(X-1)
  290 ENDPROC
  300 DEFPROCdoit
  310 REPEAT
  320 PRINTTAB(X-1,Y);
  330 key=GET:IF key<>13 PROCmove(key)
  340 UNTIL key=13
  350 VDU7
  360 ENDPROC
  370 DEFPROCplot(A,B,C,D)
  380 IF A<C THEN left=A:right=C ELSE le
ft=C:right=A
  390 IF B<D THEN top=B:bottom=D ELSE to
p=D:bottom=B
  400 width=right-left:height=bottom-top
  410 PROCdemo(left,top,width,height)
  420 ENDPROC
  430 DEFPROCdemo(left,top,width,height)
  440 VDU1,55,35,48+1,32+left,32+top,32+
width,33+height,style
  450 REM PRINT" VDU1,55,35,";48+1;",";3
2+left;",";32+top;",";32+width;",";33+he
ight;",";style
  460 VDU1,50,73,49;
  470 PRINTSTRING$(255,"*");STRING$(255,
"*");STRING$(255,"*");"EXTENT OF WINDOW"
  480 FOR T=1 TO 3000:NEXT T
  490 ENDPROC
  500 DEFPROCstyle
  510 CLS
  520 PRINT"First choose the window sty
le"
  530 PRINT"1......Without any border l
ines."
  540 PRINT"2......With vertical border
lines."
  550 PRINT"3......Lines with'Brackets'f
or inverse header."
  560 PRINT"4......Finish."
  570 REPEAT
  580 choice=GET
  590 UNTIL choice>48 AND choice<54
  600 IF choice=52 GOTO 8000
  610 IF choice=51 THEN choice=52
  620 style=choice+79
  630 ENDPROC
  640 DEFPROCprint
  650 VDU1,50,67,56;:VDU1,83,1,67
  660 PRINT"PRESS TAB "O INCLUDE IN LIS
TING"
  670 PRINT"OR ANY OTHER KEY TO RE-DEFI
NE"
  680 tab=GET
  690 IF tab<>9 ENDPROC
  700 L%=L%+10:W%=W%+49
  710 L$=STR$(L%):W$=STR$(W%):left$=STR$
(32+left):top$=STR$(32+top):width$=STR$(
32+width):height$=STR$(33+height):style$
=STR$(style)
  720 W%=W%-48
  730 OSCLI"*CLI #B"+L$+"VDU1,55,35,"+W$
+","+left$+","+top$+","+width$+","+heigh
t$+","+style$+":REM VDU1,50,action,"+W$+
"; to call"EGOTO60"E"
  740 ENDPROC
  750 ON ERROR OFF:PROCreset:REPORT:END
  760 DEFPROCreset
  770 VDU1,50,67,56;1,83,1,67
  790 ENDPROC
 8000 PROCreset
 8010 *CLI DELETE,8000"E
 9000 REM Windows defined below.      ac
tion in the call statement will be:
 9010 REM                             73
=first time selected
 9020 REM                             72
=thereafter select only or
 9030 REM                             67
=select and clear
 9040 REM                             VD
U1,50,67,56; resets screen to normal.
 9050 REM
```



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Immaculate conception

Tony Leah uncovers the origins of a successful software house

NOT so many years ago the quiet county of Hertfordshire had so few claims to fame that straw plaiting was listed in reference works as one its commercial assets. Today the towns that straddle the M1 and A1 arteries slicing through its green pastures are home to a host of companies in the forefront of UK computing.

One of these is Computer Concepts – perhaps the most durable name in the BBC Micro marketplace after Acorn itself. Since the late 1970s the company has been producing innovative software for a procession of machines from the Cambridge workshops.

Charles Moir, founder of Computer Concepts, had the advantage of attending Oundle, a school notable for its electronics facilities. It also did no harm that he and his sister Catherine, who now runs the business side, grew up in a house where scientific equipment abounded.

Their father, a world-renowned acoustical engineer, operated his consultancy practice from the family home in Kings Langley. "So, as well as Charles having excellent facilities at school, we had laboratories and offices attached to our home. Looking back, it was good preparation for what was to come", recalls Catherine Moir.

Having left school, where his enthusiasm for computing was aroused, Charles began writing software for Acorn's first micro – the Atom – in the late 1970s.

His work, not surprisingly for a teenager, was essentially directed toward shoot-'em-up entertainment software. "I began serious computing in 1978 by building my own Nascom 1 Z80-based micro", he recalls. "Later I produced programmers' utilities and games for the Acorn Atom".

Charles was helped along by his mother who, although having no knowledge of computers, had a lot of business experience. "Mother was just as essential in starting up the company as any other factor", says Catherine who joined the firm full time three years ago after taking a degree in economics at Cambridge.

Computer Concepts was launched in 1980, Charles doing the programming and his mother looking after business. "It was known that the BBC Micro was going to be created so the company was set up to sell Atom products as a sort of trial run for BBC Micro software", he said.

The firm was kept ticking over by mail order response to small advertisements in the few magazines that then existed for computer enthusiasts.

But the scale of business changed dramatically once Wordwise was released in 1981. "Right from the start Charles had been working on the software that became Wordwise", said Catherine Moir. "It was our first major product and took Charles 18 months, if not more, to write. We were probably the first software house to start work on the BBC Micro – certainly Wordwise was the first substantial piece of software available for the machine.

"It was also unusual in that it was supplied on eprom rather than disc or cassette. This had great quality advantages, as well as being difficult to pirate casually.

"Our headstart meant we were the only software house with the necessary expertise to write roms. And we took advantage of our lead to establish ourselves as the leading software house in the BBC Micro market".

"I had the intention from day one to write a rom-based word processor for the Beeb", said Charles. "And it was very lucky we were able to get it out reasonably early and that it was accepted as being a good product.

"I was also helped by Acorn's inability to provide any real competition – and when they did they never had enough roms available.

"At this time we produced other rom utilities for the BBC Micro such as Disc Doctor – not written by me but by some talented locals. We just made sure the programs performed ok and marketed them – along with the graphics extension rom and some good games like Android Attack.

"It wasn't long after this we decided the games market was simply too volatile and that the serious applications and utility market was more attractive.

"And that is where we've stayed to this day, producing applications – such as our new document processor – and programming languages, the latest of which is a PostScript-compatible graphics language for the Archimedes that is 20 or 30 times faster than traditional PostScript interpreters".

Expanding rapidly over the first three or four years, the company changed its emphasis to business applications programs and programmers utilities: "All the popular sorts of things", said Catherine. "We gave up games pretty quickly – they didn't look like leading anywhere very interesting".

Wordwise was a true mega-seller. To illustrate just how big a success it was, consider that Acorn has sold something like 700,000 BBC Micros in the UK while Computer Concepts has sold more than 120,000 copies of Wordwise and its derivatives and more than twice that number of roms for the BBC Micro.

Says Catherine: "As far as the BBC Micro market is concerned the trick has been to keep on top of Acorn's developments – its new machines and add-ons – and to always be early on to the shelves.

"However good a program is at the time of release, you can be fairly sure it will look dated within 18 months. We feel we've continued to be successful because we have always anticipated the rapidly increasing sophistication and expectations of the end users.

"Proof of this is that we have written and sold three word processors for the same machine since 1981. In 1982 Wordwise was the best selling word processor for the BBC Micro and in 1988 it was Inter-Word. Practically the only similarity is that they were both the most highly specified and user-friendly word processors available at their time of release".

Charles said: "I've never believed in writing for

Some of the Computer Concepts staff outside Gaddesden Place

STATE OF THE ART

NOT many programmers can step from their keyboards straight into a swimming pool or on to a tennis court for a relaxing break. But Computer Concepts software writers can. They can also enjoy a game of snooker if they prefer.

All these recreational facilities are on tap at Gaddesden Place, a handsome Grade II listed building set in eight acres of parkland near Hemel Hempstead, into which the company moved in 1984.

"The place was empty and decoratively in very bad order", said Catherine Moir. "We're restoring it to its former glory as much as is possible.

"Of course costs are high, but the large rooms here make extremely functional offices and the setting is certainly preferable to the alternative – an industrial unit in Hemel Hempstead".

a whole range of machines, rather that it was better to concentrate on one machine and offer the very best product for that market".

"Over the years we have been very lucky, and very successful, in being able to develop products for machines that are technically interesting. I don't see that I would ever write programs for PC-based systems, which in my opinion are old hat, not well designed and very boring.

"However, having said that, we are interested in taking Risc technology into the PC market, since we can show hardware and software doing things PC users have never seen before".

The company has also become more hardware orientated. "Although our main business has been software we have, in fact, done some hardware before", said Catherine. "We designed carrier boards for our eproms on the BBC Micro and we've since released a rom expansion card for the Archimedes and a fax card".

And the BBC Micro? "You just can't forget it", said Catherine. "It is still a big market, there are a lot of users out there and our products are selling well. We haven't got anything new planned at the moment – largely because we're so busy with Risc products – but it's always a possibility".

Computer Concepts currently employs about 20 full time workers, along with a number of contract programmers, outworkers and casuals. Most of the technical staff are graduates, recruited through university careers centres and the trade press.

"The programmers, and in fact nearly all employees including two of the three directors, are under 30, which contributes to a relaxed and friendly atmosphere", said Catherine.

"Programmers can be sensitive and difficult individuals and we hope this is the arrangement that suits them best. It seems to be working – staff turnover is low and most of the original team are still with us".

Said Charles: "To illustrate the advance that has been made over the last few years, the first word processor we did was the 8k Wordwise in 1981. The current word processor for the Archimedes has kept several people busy for a year and will be a squeeze to fit into 128k. We'll also need 128k for the spelling checker and ideally another 256k for a thesaurus – a total of over 500k of code and data.

"One thing hasn't changed – programmers still use all the space available".

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Basic improvements

Getting more out of your Archimedes is easy with Terry Blunt's utilities

ALTHOUGH excellent, Basic V doesn't do everything that the experienced programmer needs. The Archimedes routines given here are intended to be installed as a library and used as an aid to Basic programmers. Some are program modifying routines and as such could only work as library routines or as machine code equivalents.

The advantages of using a library for this type of routine is two-fold. Firstly only legal Basic statements are used, so the routines can be called with confidence in all configurations. And as they are in the form of ordinary Basic procedures it is relatively easy to customise them or add to them to suit your own needs.

In an attempt to reduce the possibility of name clashes with a resident program, the entry procedures are standardised in that they have totally upper case names – most programmers use lower case procedure names to improve readability. All the secondary procedures and functions start with an upper case U and the rest of the name is lower case.

As far as possible the routines that don't modify the currently resident programs have been designed to cause minimum disturbance to the variable stack. This is one reason for the curious use of indirection operators in some places – another is that some routines are forced to corrupt the variable stack and in this situation the values have to be held somewhere else.

Type in the listing, ensure it is correct with Get it Right! and then save it. When you want to use the utilities issue:

```
INSTALL "Bas_Utils"
```

The features are all called by entering PROC plus their name while in command mode – using them while the program is running is not a good idea.

Here is a full list of commands and what they do:

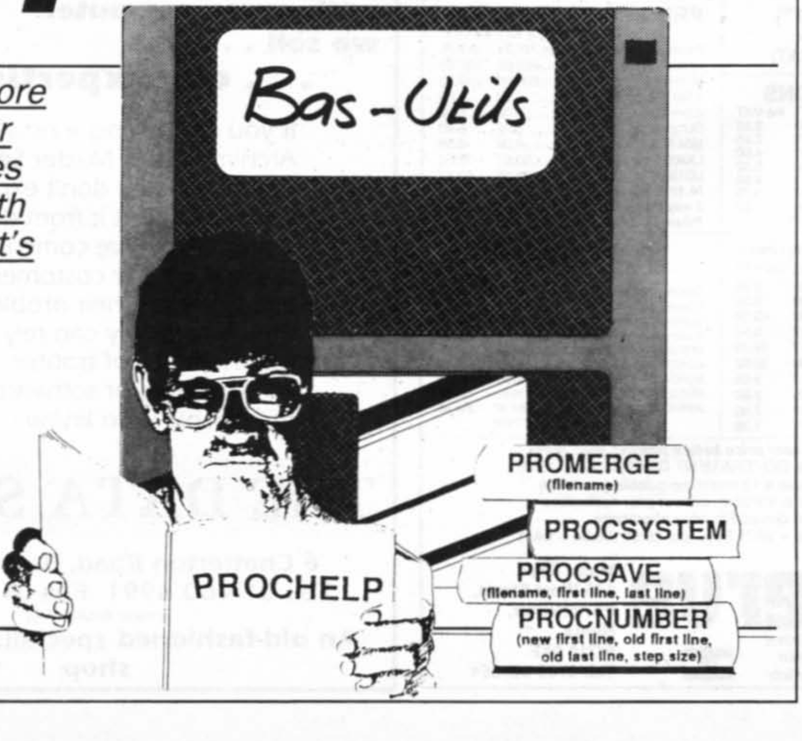
PROCHELP: Lists all the other routines, displaying their parameter requirements.

PROCMERGE(filename): Merges the named Basic program into the one currently resident. Unlike APPEND, this is a true merge, with each new line being fitted in between existing ones. A new line with the same number as an existing one will overwrite it. The routine checks the validity of every line before merging it, halting with an appropriate message if it fails. The routine exits with an OLD to tidy the Basic pointers.

PROCNUMBER(new first line,old first line,old last line, step size): Performs a partial renumber of any block of lines within the resident program. Unlike the Basic renumber, the routine makes two passes. The first checks that there are no unmatched GOTO or RESTORE statements – it will not attempt to renumber any lines and reports the first error it finds.

Checks are made for new line numbers that

Turn to Page 125 ▶


Bas-Utils
PROMERGE
(filename)
PROCSYSTEM
PROCSAVE
(filename, first line, last line)
PROCNUMBER
(new first line, old first line, old last line, step size)
PROCHELP

> *"The Archimedes routines given here are intended to be installed as a library"*

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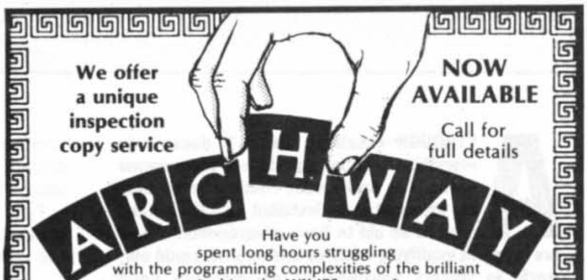

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CEEFAX Guide

B B+ M

Software is currently transmitted for a period of one week. Files are available from Friday afternoons to the following Thursday evening, with the exception of the Issues teachers' notes which, due to their topical nature, are available from the Wednesday morning to the following Tuesday evening during the week of transmission. The details are provisional only.

March 3 to 9

TVDiary **TVProgs**
Produce your own TV viewing timetable using timings taken from the Ceefax TV listings pages. The routine will indicate any overlapping programmes and give the running times – a very useful feature when setting your video recorder.

M7Disp **DataA** **DataB**
DataC **DataD** **DataE**
DataF **DataG** **DataH**
DataI **DataJ** **ReadMe**
Creating Mode 7 display screens for your own programs can be awkward and time consuming. This package will save you hours of tedious typing and allow you to create far more ambitious designs which may be written automatically to disc as a Basic program.

T/TTX01 **Counter**
The second module in the series on interfacing with the Acorn teletext adapter takes a look at designing software that doesn't use either TFS or ATS. A program for processing teletext generated interrupts and selecting channels is also included, together with full documentation.

Skulls
A superb implementation of the original shape-fitting game from Russia. It was first published in the February issue of *The Micro User*

March 10 to 16

Editor **Example** **Trap**
E/info **Proginf**
This font designer software allows you to design your own characters to use when printing. You can also use the Editor on the user-defined graphics characters of the BBC Micro.

Tune **Info**
Cover up the noise of those clattering keys with this ingenious music program. Once loaded, the code resides high in memory and, utilising events, it can continue processing simultaneously with another program. It's a good example of how interrupt-driven routines can be usefully applied and full documentation is provided.

T/TTX02 **Header**
This week's examination of the Acorn teletext adapter looks at the header packet format of a teletext page. Individual packet functions are explained together with techniques for reading data from the adapter into the memory of your micro. The program Header demonstrates the ability to do this, and works independently of the TFS or ATS operating systems.

Protect
This routine, first published in the February issue of *The Micro User*, automatically puts codes into your own Basic programs so that unauthorised people will not be able to list them.

March 17 to 23

SectEd **Edit**
This very powerful utility enables far more to be gained from your disc drive by letting you view and edit individual tracks, sectors, or bytes. You can use it to investigate how data is stored, and access corrupted discs to try to retrieve lost files.

Title **Prog1** **Prog2**
Zoom **Pixel** **Colfill**
Images created from sources like video digitisers can be edited and modified to suit your precise purpose with this comprehensive suite of programs.

T/TTX03 **Grabber**
Page grabbing is the subject of this week's delve into the workings of the Acorn teletext adapter. Identifying pages and a full description of the header packet are given, together with an example program.

Animate
This superb moving pictures utility from the March issue of *The Micro User* lets you bring your Mode 2 diagrams to life.

March 24 to 30

Catmast **Mastcat**
Do you have difficulty in finding a particular program you know is saved somwhere but are not sure on which disc? Save the tedious task of cataloguing every disc you have – use Catmast. The routine will store the file titles on all your discs, making finding any particular program a very simple task.

Phelp **Pscreen** **Printer**
This very useful utility is designed to test the working and quality of your printer. The facilities for printing out a test page of many different fonts can be used for quality comparison with other printers – and checking your own one, too.

T/TTX04 **Keyword**
Searching teletext for keywords is the subject of this weeks tutorial on interfacing with the the Acorn adapter. Ideas outlined in the previous module are developed and used in Keyword – the program accompanying this module.

Patience
There are lots of versions of Patience, and here's an unusual one for your BBC Micro. It was first published in the March issue of *The Micro User*

March 31 to April 6

Rules **Scores** **Ships**
Take to the seas with the help of your micro in this highly traditional game of battleships.

Info **TTxPrCj** **TTxPrint**
Obtain superb colour printouts of teletext pages with this software to drive an Integrex Colourjet 132 printer. A size option is included and any page may be output.

Exnote **Intro** **BroomBZ**
Duets **Higalul** **Jigs**
Music from your micro with these very tuneful files. The first in a series of three parts to be used by the program Intro. It is menu-driven and a selection of traditional melodies can be built up.

T/TTX05 **TSDP0**
The teletext tutorial continues this week with a look at independent data packets. It's a unique chance to discover some of the system's basic workings.

Split
This useful utility lets you split files that are too long to load in to your word processor. It was first published in the February issue of *The Micro User*

The land of Shades

by someone who has been there and survived

GREETINGS again. Although I have told you a bit about fighting in Shades it will be many days before you can do it well. And there's little fun in getting treasure and losing it all straightaway just because Spitzen or Overlord creeps up behind and bashes you.

Also it is not a good idea to sit around chatting to someone in the same place all the time – the killers will catch you for sure.

There are 'Safe' places where you can hide and you should know about them. Spells will not work on you nor can anyone fight you, although you can still lose treasure if there is a thief about.

There is only one safe place actually in the game itself – the church in the city. So if you want a little rest without leaving the game altogether, the church is a good place to do it.

If you want to find out where all the treasure is, you can type WH T. But it is a great long list, and while you are reading it somebody could sneak up and bash you. But if you go to the church first you can sit in a pew and do all your WHERE spells safely.

Also safe is the first location Lost In Darkness (called LID) and everything to the east of that – the pub, the guest rooms, the Bridal Suite and so on.

These places are called the Chat area, and people go there just to talk to each other and look at the Top 40 scoreboard to see who the best players are and how much they are worth to kill, he he.

Chatting is fun. You can use TELL NERD You are a nerd, or SAY Nerd is a nerd, or SHOUT Nerd is a nerd! The first one speaks only to the player Nerd, the second speaks to all in the same place, and the third shouts about Nerd all over the game.

Sometimes people want to do a bit more, and so there is EMOTE. This lets you do anything you like. If I type EMOTE picks her teeth, everyone will see "Whirlwind picks her teeth".

Some common emotions are already there. So if I type KISS Zimmerman, Zimmerman will get the message "Whirlwind kisses you slowly and sexily". Bleughhh! As if I would.

But if it was somebody I liked, maybe we would end up in the Bridal Suite where nobody else can follow unless they are invited.

Next month I will talk about the puzzles. Mind you I am not giving all the answers – Lordant or Hazeii would blot me and I would never play again!

May the Goddess go with you,
Whirlwind

PS A big hello to Nibnib, Shnibob, Heechi, Shoooty, Stunner and all other immortals with really silly names. Also to Stephanie, Sheryn, Wizrik and Mak, who thinks I am Heloise or Ellie, what a clown!

You can enter the land of Shades using your micro, a modem – and a registration to MicroLink.
If you are not a member write for details to: MicroLink, Europa House, Adlington Park, Adlington, Macclesfield SK10 4NP.

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UPDATE

Save time on a timetable

MINERVA Software (0392 437756) claims its latest package will reduce the period needed to prepare school timetables from weeks to minutes. Timetabler will produce one for the largest school in England in 10 minutes according to its developers.

Details of streams, staff and rooms are entered and student data can also be included. Once the timetable is drawn up, any changes needed can be easily implemented. "Timetabler will alleviate all the headaches of producing timetables while saving time and money. It will probably pay for itself when you produce your first timetable", says Minerva.

Timetabler runs only on the Archimedes and costs £688.85.

Acorn offers help for teachers

ACORN has launched a free Acorn Schools Service to help keep teachers abreast of latest hardware and software developments. It will provide a programme of regular updates, information and software support for teachers at all levels of school computing.

The support service, which is devised to help teachers make the most of their school computers, will pass on latest information about new products, applications, ideas and experiments for the BBC B, Master series and Archimedes.

Along with the service come free copies of the BBC-produced Micro News video, free subscription to Acorn's Education News publication, three months free use of the support information database SID, and specialist dealer back-up. Teachers can make use of the support service using enrolment forms which have been mailed to schools.

Micros on the moors

BRADFORD and Ilkley Community College is running two summer courses in creative computing, combining a series of lectures with visits to Yorkshire beauty spots and tourist attractions.

Course tutor Colin Sutton, who is a full time lecturer at the college said: "These are not just boring computer courses but something different with the emphasis on being creative and imaginative with a micro. They are ideal for beginners or those with a little knowledge, particularly of the BBC B, Master 128 and Master Compact. The courses are particularly useful for teachers with access to school machines".

Courses run from July 8 to 15 and from July 15 to 22. Accommodation is available on the campus and the courses cost £185.52. For full details contact the Course Director, Bradford Summer School, Bradford & Ilkley Community College, Great Horton Road, Bradford, West Yorkshire, BD7 1AY.

Read write course

EDUCATIONAL software house LCL (0491 579345) has brought out what it believes to be the first ever comprehensive reading and writing course on a micro. Called Reading Writing Course it is the company's first new title in almost two years and runs on BBC B, Master, Master Compact and Archimedes.

READING
WRITING
COURSE

Comprehensive course from LCL

It consists of 24 programs on two discs with two books and voice tape and is suitable for younger children of three and over. Price: £24.

Turn to Page 70 ▶

◄ From Page 69

Masterly gesture

ACORN marked the manufacture of its 200,000th Master by presenting it to Westway School, Burnley, which caters for 50 mentally and physically handicapped children. Harvey Coleman, managing director of Acorn Computers, is pictured above (right) handing over the machine to the school's head teacher, Stephen West.

Industry facing recruits shortage

INDUSTRY Minister Eric Forth has called for better links between the computer industry and schools to avoid recruitment problems in the 1990s. Speaking to the Computer Services Assocation, he said the country was heading for a demographic ditch.

"The number of under-25s in the labour market is expected to fall by about 1.2 million by 1995", he said. "There are many changes in the labour market in prospect. Young people are set to become a scarce and valuable asset in the very near future".

He emphasised the Department of Trade and Industry's Enterprise and Education Initiative will provide every school leaver with two weeks of work experience and 10 per cent of teachers with first hand experience of the world of enterprise.

"If your industry is to compete for the school leavers it needs, it will have to establish a good reputation in schools. What better way could there be of establishing that reputation than by letting pupils and teachers spend a fortnight with you?", he asked members of the association.

"The reliance that the rest of British industry and commerce places on information technology demands that all IT suppliers train and retrain staff to the highest standards".

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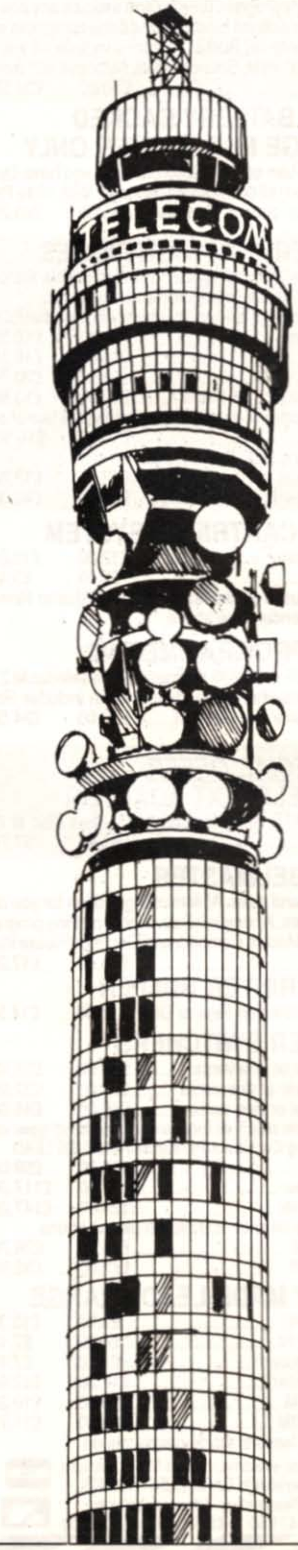
Proven to be one of the best ways to introduce newcomers to programming, as well as being extremely versatile and fast enough for the most experienced programmer, and at the incredibly reduced price of £19.95, Acornsoft Logo is a language that should be in everyone's collection!

To order your pack, please turn to the form on Page 135

SOFTWARE PACKAGES FOR SCHOOLS



British Telecom has produced three new science-based software packages for schools in collaboration with the Computers in the Curriculum Project, Kings College, University of London.

The programs are designed for students, aged from 14 onwards, following physics, electronics and technology courses.

PULSE CODE MODULATION

This program allows the student to investigate how, by Pulse Code Modulation, and analogue signal – speech, sound and video – are converted (coded) into digital pulses, transmitted and decoded back into a replica of the original analogue signal. The written material includes information on the conversion process, sampling, frequency levels, distortion and how PCM equipment is utilised in the construction of telephone systems.

SIGNAL TRANSFER

This interactive icon driven program provides students with the opportunity of devising a telephone link, requiring them to set up, transmit and receive a comprehensible signal from one exchange to another.

Users will be able to test the strength and attenuation of signals, incorporate cables, regenerators and exchanges into their telephone link and assess, at any point in time, line loss and signal to noise ratios.

PICTURE MANIPULATION

The program is designed for students to experiment with some of the manipulations that can be made on a video signal once it has been digitised.

The student is introduced to a simplified version of the processes involved, the various ways of altering the information to produce a modified picture and the use of the logical operations such as AND, OR, NOT and NOR as a means of changing colours.

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The national curriculum and IT

Marshall Anderson forecasts what the future holds in store

FOR some time now there have been committees up and down the country developing the national curriculum, a document that concerns all those with any interest in education. It will set out what is to be taught in schools in the foreseeable future. Many of the final consultative documents are now available, along with several interim reports, and this is a good time to look at where they are taking us.

When something as important as this appears all those concerned take up points of view and start to shout a lot. The government says it is a jolly good thing for there to be agreement nationally on what is taught and points out that our competitors all have national curricula – especially the Japanese, and that must be why they produce better toasters than us.

The teachers point out that there already is agreement and that any further straight-jacketing will stifle the creativity that our competitors envy and are presently trying to copy – especially the Japanese.

Some employers want a more well-rounded education for their future employees while others want schools to turn out a ready-trained work force. Parents don't really know what they want except that it ought to involve some standards and no one seems to be asking the pupils what they want – to be left alone, probably.

So how does all this affect Information Technology in schools? Let's look at the starting point. Primary schools made steady progress over the past eight years developing uses of IT, and most now have at least one micro. These are being used to support the curriculum through word processing, databases and so on, and have added to the curriculum investigations in Logo and control technology.

However, the average ratio of children to micros is above 100 to 1, which means they are of limited use to a developing curriculum in any school – if you can't guarantee availability of a micro to a child it is difficult to write it into his scheme of work.

Secondary education has had a different experience. At first IT meant computer studies, and was seen as the subject to take. Since then there has been considerable re-evaluation, and industry and further education no longer see examination success in computer studies as desperately important, if ever they did.

Schools still have difficulty recruiting qualified staff in computing. Apparently only 26 graduates applied for computer studies teaching courses in 1987, and there has been a drop from 120,764 computer studies exam entries in 1985 to 83,131 in 1988 – about 30 per cent.

While this decline in computer studies has been going on there has been an increase in the use of the micro across the curriculum as a tool rather than the object of study.

This is the starting point for the national curriculum terms of reference – computing is not a subject any more. The national curriculum sees computing, or more exactly, Information Technology, as something involved in most areas of the curriculum. However, those compiling the design and technology part of the curriculum have been asked to try to tie the whole thing together. Looking at the interim report released by this group, we can see what direction things are taking.

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Their starting point is that *The development of IT capability is an essential part of the education of every pupil*. From here the main emphasis in the document is on appropriateness, that pupils should be introduced to uses of IT when they can both understand and make full use of them. For example, children may be able to learn the full range of facilities offered by a word processor but not have reached a stage in language development that makes those facilities relevant.

Through various activities students will *develop basic computer skills in the context of worthwhile applications of IT*. It does, however, seem to be

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leaving it to the individual schools to develop their own IT policy based around the specific attainment targets the national curriculum is setting.

At first this might be seen as a positive move, but there are resourcing implications for this sort of thing. It seems unlikely that very specific expectations can be laid down simply because IT is very expensive, both from the point of view of equipment and the possible extra payments needed to attract the staff to run all this.

> *Its writers make no bones about the fact that they see IT as a vital component and in no way optional*

The document outlines the sort of skills children will need. They should be able to communicate with the technology using keyboards, mice and so on, but are not expected to touch type. They should be able to store, process and retrieve information and present it in a variety of ways. They should also be able to communicate information, possibly using viewdata or electronic mail.

They should be able to use a micro to set up simulations and models as well as monitoring and controlling things in the real world. They should also be aware that technology is not an end in itself, and problems should be solved with technology of an appropriate level.

As children progress they will meet different uses of technology, and be able to evaluate it. They will develop knowledge of the characteristics of IT and exploit tools, materials and techniques to design, develop and modify IT systems. They will also be able to *make informed judgments about the social and economic effects of the applications of IT*. It is encouraging to see this last reference, and the specific examples given regarding the invasion of privacy and effect on employment.

The sort of attainment targets the group expects to produce look like this:

- At the age of about seven pupils will be expected to store, retrieve, modify and use information though that information may be of any type – perhaps pictures or short pieces of writing.
- By 11 years a child should be able to make use of a database by adding information to it, spot unusual data in it and present findings appropriately.
- An average 16-year-old might gather information and create a database to process it and a very able 16-year-old would be able to use IT to help gather that information and present results in several forms.

Other subject groups are further down the road to completion of their curricula, and it is interesting to see just how they apply the ideas and ideals of the design and technology group.

The Language 5-11 group have produced a guide in which IT barely fills a page. There is a paragraph on the perception of artificial intelligence and the way pupils relate to the machine as expert, but no attainment targets. They do say that the English classroom is a place where pupils learn to use IT to send messages, produce language work for different audiences and show critical understanding of the ways information may be manipulated.

There is an implicit enthusiasm for the way in which IT gets children's work to new audiences via electronic mail and desktop publishing, but no reference to the springboard the micro can provide for language, through the use of adventures or other creative software.

The Maths 5-16 document is similarly brief on the subject, but far more specific. It sees micros as having three uses: Helping teach specific concepts via computer assisted learning packages, as a tool for practising maths and for programming in maths. In this area there is much reference to Logo, though Basic is seen to have a place, but the most striking thing is the straightforward statement that *until pupils have ready access to computers ... it is not appropriate to specify the use of the computer in the attainment targets themselves.*

Science 5-16 has the most direct approach – IT is actually included in Attainment Target 11: *Pupils should develop their knowledge and understanding of scientific aspects of information transfer and management and its use in control.*

At specific levels AT 11 demands; *Children's work in a wide variety of areas should incorporate the use of information technology...* and ... *children should have the opportunity to use information technology to monitor and gather data ... simulate physical/biological systems ... access and organise data ... control external electronic, electric or mechanical devices.*

Throughout the document its writers make no bones about the fact that they see IT as a vital component and in no way optional, they are also as straight as they can be about the fact that all this is going to cost money.

In the end that is the bottom line. If the government wants to improve the education system it will cost money, and IT is an area that will cost more than most. We will be able to see just how committed the government is to this when the Bill is presented, but the different approaches of the different working groups tends to suggest that some are more confident than others of the support they will receive.

Influencing people

Can a micro help you discover yourself? Marshall Anderson investigates

Product: Personal, Social and Moral Education Module 1
Price: £20.00
Supplier: Coventry CBL, Casselden House, Greyfriars Lane, Coventry CV1 2GY.
Tel: 0203 831756

A NEW release from the Coventry CBL unit is the first module of its Personal, Social and Moral Education package. This is probably the first attempt anyone has made to deal with this educational minefield, and the package looks at some of the issues children face when starting a new school.

The pack supplements existing Personal and Social Development schemes for children over the age of about 10 and is meant to be about 50 per cent micro-based. A large number of preparatory/follow-up worksheets are included to support the program which helps with the resourcing problems found in similar exercises.

The manual sets out some far reaching objectives: *On completion of this unit the user will be able to: Distinguish various levels of dishonesty and understand how they arise; cope with the problems of failure; apply appropriate negotiating skills.*

It seems unlikely that any software could hope to achieve such objectives, rather the materials might more reasonably hope to develop and encourage such skills. This may seem a pedantic point, but if objectives are non-achievable from the outset then nobody is going to feel satisfied with the result.

The software itself is in three units. First is Coping with a new environment. Here you are asked to find a desk in a classroom and are then given the pros and cons, both social and physical, of sitting there. Then you choose a work partner, again comments are given on the choice and finally you're asked to join in with some extra-curricular activities. There is an emphasis on sport here, with other group activities relegated to one question. The sporting ones get to play a simple football game, the rest have to watch.

Throughout the package a small success meter at the top of the screen tells you how you are doing. And at the end of each unit there is a display of performance as a graph in terms of positive or negative. But there is no scale on the Y axis and it's difficult to know just how much is good or enough, though it does point out relative strengths and weaknesses. For the first unit the attributes measured are decisiveness, assertiveness, sociability and sports skills, though it is unclear from where the last takes its score – unless it's the video game.

In unit two – Interaction with others – you must get to the dining hall before the food runs out. In doing this you have to ask people the way and if you use the key words please and thank you or thanks – but not any likely misspellings – you get there on time.

At the tuck shop there is a setup that feels true to life: You join what appears to be the end of the queue but then a door opens to reveal the rest of it and you're accused of pushing in. There are options for dealing with this situation, but the real test is the reaction the following day when someone pushes in front of you.

There's then a little piece on sharing tasks in a cooking lesson, followed by a dice game played against the micro. You are in charge of moving your own counter here, and basically the program is checking to see if you cheat. The problem is that it's easy to make the odd error and I had to play the game four times working very carefully before I was given a clean bill. At the end of the unit the graph shows manners, diplomacy, negotiation, decisiveness and honesty.

In Yourself as others see you there is a test to be completed. As this is multiple choice and all answers offered are correct – I think – you can get top marks while the rest of the class somehow manages to do badly. You are then asked to cope with this success without alienating others.

Following this you are asked about your reactions to the unfortunate Higgins who is short, fat, spotty, wears glasses and has bad breath. After being given a score based on your treatment of him you are asked to consider the fact that this

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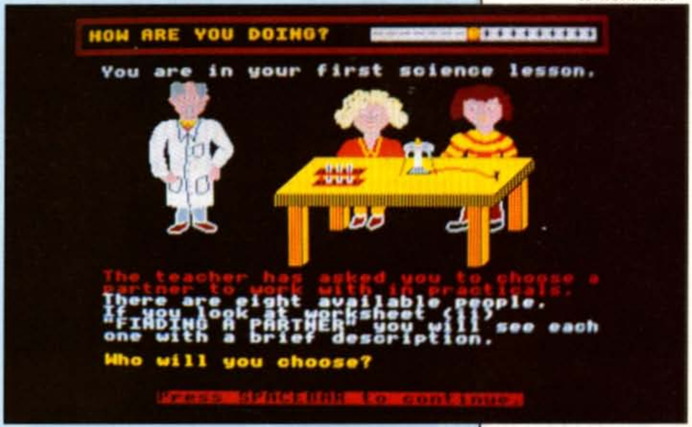

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HOW ARE YOU DOING?

You are in your first science lesson.

The teacher has asked you to choose a
partner to work with in practicals.
There are eight available people.
If you look at worksheet (11)
"FINDING A PARTNER" you will see each
one with a brief description.

Who will you choose?

Press SPACEBAR to continue.
```

Deciding who to work with

SUMMING UP

Personal, Social and Moral Education Module 1 is an interesting and original set of programs with the potential for much interactive class work. The subject tackled is definitely hard to grasp, but has been handled reasonably well.

Unfortunately a program like this is subject to the opinions of the originator, which may not conform either to generally accepted – or sensible – behaviour, or perhaps the mores of a particular ethnic group. However, bearing this in mind it can be useful.

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could happen to you.

Finally there is an exam failure and you have to choose strategies that deal with this and try to do better next time.

The pack makes good use of what micros can do: Respond flexibly to the input, if in a limited way. It creates a fairly believable environment for you to interact with, and only occasionally simplifies things to a patronising level. However, it does make value judgements about correctness of behaviour, letting the class bully push in front of you evokes the response: *Good, you show a sense of self preservation*. This provides a good starting point for discussion, but in isolation could leave students with some simplistic impressions of behaviour.

Heavy metal

Ian Dickinson discovers a program to help him in project design

Product: CDT Materials: Investigation and Choice
Price: £19.55
Supplier: Thames Education, 149 Tottenham Court Road, London W1P 9LL.
Tel: 01-387 9494

IT is not very often that software appears that is specifically aimed at the craft, design and technology department and I received a copy of CDT Materials: Investigation and Choice with cautious anticipation. The package itself consists of a materials disc, the Key database and documentation. The first disc is the main package, containing the properties of 83 materials ranging from the very well known to completely unheard of ones.

Loading the software presents you with a title screen and then moves on to the main program. You are then presented with a simple selection menu where, if it's the first time that the package is being used, it is possible to select the Introduction and you are given a short tutorial on how to use it – a very nice feature.

After familiarising yourself with the package you enter the Information section and have a go at using the software for what it is designed for – investigating the properties of materials. At this point you can examine, search on property or search on range. These options let you find the relevant properties of materials you may wish to use, and it is here that I had my first doubts about the system.

Firstly, it uses a series of icons to depict the properties of materials. When one is selected you are presented with the information that you need but some icons just look like squiggles and are somewhat confusing – at least they have the relevant word labelled at the side.

Also, if you decide to search on range in order to find properties of materials you are presented with a graph which has two adjustable vertical lines. These are moved to the required range band for the search – a nice idea but difficult to use if you wish to interrogate the datafile for a specific quantity.

Another confusing aspect relates to the units used. For example, a material's compressive strength and density are given in SI units. This is all very well, but the literature supplied suggests that the package is to be used within the 11 to 16 age range. This is rather optimistic, 16 to 18 may well be a closer estimate of the pupils that would benefit most.

Some very interesting facts can be discovered when looking through the data. For example, did you know that leather is heavier than lead? This is something that the CDT department could neither confirm nor deny. There are quite a few surprises like this to be gleaned when you browse through the data.

The second disc supplied is the Key database. This is the powerful data handling package that can be bought from Thames Television Education Department for the very modest price of £4.95. Data is broadcast weekly by ITV and this telesoftware can be downloaded and used in the Key.

The reason it is supplied is that the data of the main program is in Key-compatible form so you can do more complex searches – for example, you can find a material that has a certain density and is not attacked by acids. It also means that you can add your own data to the file as well as correct the errors. The manual suggests that you add the names and addresses of local suppliers.

The documentation is rather disappointing. It is supplied as a booklet of 14 sides of A4 pages with a glossy cover but is let down by the contents' presentation. A concise table of icon meanings would have been useful, rather than the scattered diagrams provided. The worksheets are presented in a very uninteresting and monotonous manner – particularly bad for fulfilling its prophesy of being useful to 11-year-olds. The documentation should be completely re-written.

In conclusion, the package can be said to be a real Jeckyl and Hyde. It is certainly a useful addition to the CDT software library and could save a lot of laborious work looking for the correct materials to use in projects. However, you would have to be fully conversant with the package before letting children use it.

It is well put together with a potentially helpful user interface, but could be improved a great deal – the documentation presented with more clarity and explanation of the software's potential given higher priority.

SUMMING UP

The overall presentation of this package is good but it is almost completely let down by the documentation, which might as well be thrown away. Luckily it is reasonably easy to use, so you are not held back by the manual. If you are familiar with the Key the possibilities become quite impressive but that takes it away from its primary purpose of selecting materials for given projects.

Being disc-based, some of the searches and accessing can be slow but this is the price you pay for a large database, and unless you are careful, the occasional error in the data itself could lead you astray. This is completely outweighed by the ability to add to and amend the database.

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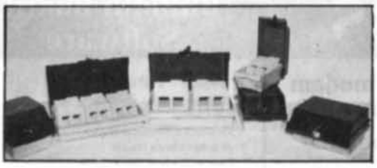

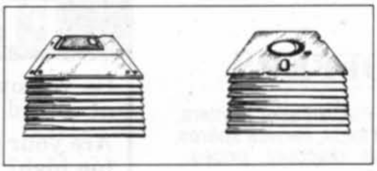

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Learning can be fun

Shelley Gibson gives some new educational software the classroom treatment

Product: Fun School 2 (Under-6s, 6-8s and Over-8s)
Price: £9.95 (tape), £12.95 (disc)
Supplier: Database Educational Software, Europa House, Adlington Park, Adlington, Macclesfield SK10 4NP.
Tel: 0625 878888

THIS suite of programs is intended for both school and home use and comes on three separate discs, categorised by age range. Attractively packaged, it has instant eye-catching appeal. All the programs are colourful and simple to understand and operate regardless of the experience of the adult involved or the age of the children. It is refreshing to find that the age range label actually correlated with the children exposed to it – the Under-6 programs being especially welcome as software for reception classes requiring a minimum of teacher interaction is very rare.

These particular programs were used easily by children unfamiliar with micros and only in their second week at school, leaving Miss to do other things – usually involving paint.

The cursor in this first set of programs takes the form of an appealing teddy bear. He rewards correct responses with an amusing caper and the accompanying music is neither irritating nor too long.

There are eight programs for each age range, all adaptable to different abilities. It is also possible for you to set the skill level – although this seemed to be rather hit or miss – as well as the choice of adding your own words for use in some programs.

But what are the programs about? The all-time favourite of the reception class was undoubtedly Teddy Count. Various numbers of Teddies parade around the screen leaving the child to identify their number – very simple and extremely useful. A wrong response results in the Teddies lining up to be counted and stepping forward one by one. If you still cannot count them, they are counted for you.

Running a close second came Teddy Bear Picnic – a simple case of guiding Teddy through a maze using the arrow keys until he is successfully reunited with his food. Colour Train was very popular – a train chugs around a varying sized track towards differently coloured stations. Hit the spacebar when the colour of the station matches that of the train.

Also included is Find the Mole. With five sizes of molehill numbered proportionately the child must pick the one which hides Mr Mole. If he is in a smaller hole the word *lower* appears on the screen, should he be lurking in a larger hole *higher* is the prompt. The teachers seemed to enjoy this more than their children. Pick a Letter tests lower case letter recognition and spelling.

Using the cursor keys Teddy must be guided to the correct letter which is pickedd up and returned to the relevant space.

Spell the Word is a version of Hangman, but with the addition of pictures as clues. It would have been even better by keeping to one vowel sound and just three letter words, as it tends to jump around in phonic terms and random words were occasionally repeated in close succession. It was necessary to provide the children with a written list of words to stem the flow of "How do you spell... queries.

Shape Snap is another simple exercise. Shapes appear and if they are different you press any key except for the spacebar which you use if they're the same. Getting the match right makes them flash along with the congratulatory tune. They flash in different colours, which means that they no longer match – a little confusing for some of the younger children.

fun
school
2
For the Under-6s
DATABASE EDUCATIONAL SOFTWARE

The only program which was not used in school – but will probably find its niche at home – is Write a Letter, which is a very simple text editor. But it still has the age old problem of a keyboard in capitals and the screen in lowercase. This can often lead to children not understanding the connection between their actions and the end result. I feel that this particular program would have been more at home on the 6-8 year olds disc.

This next age group's cursor is an endearing frog which behaves in the same way as did Teddy. Number Train replaces Colour Train and is basically the same except that at each station passengers alight and board asking the children to input the new number of travellers. The picnic becomes a Maths Maze full of robots posing mathematical calculations and Hangman becomes Caterpillar. Losing its pictures you must answer correctly or the apple will be eaten by the hungry grub.

Shopping is a very simple problem exercise requiring little reading skill – given a shopping list and

fun
school
2
For 6-8 year olds
DATABASE EDUCATIONAL SOFTWARE

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◄ From Page 79

> **The true test of educational software is pupil reaction**

a row of four shops, you must guide your frog into the correct one for each item. Packing tackles another problem – an assortment of shapes must be fitted into a rectangle.

Treasure Hunt goes into coordinates and a warmer or colder technique to let children locate buried treasure on an island which has been overdrawn by a grid. My one criticism is that it has letters rather than numbers on one axis – although this can be a plus for children starting to use coordinates.

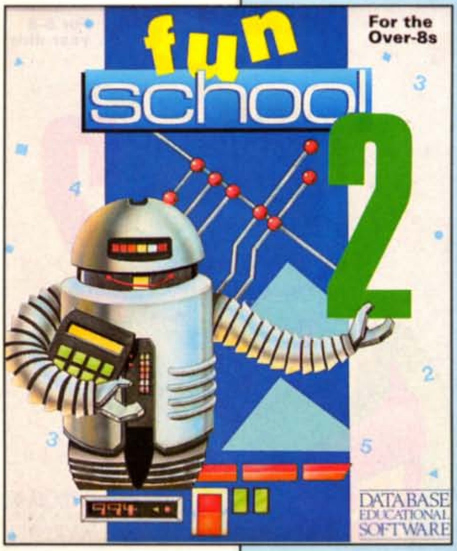
A nice tables game called Number Jump encourages the children to make the frog leap across the screen, landing on multiples of a specified number.

Finally on this disc is Bounce: I found it difficult to achieve the correct blend of coordination and logical thinking it required. The idea is to bounce a ball off a wall in such a way that it avoids obstacles. The angle of the initial throw can be changed as well as the starting position. It sounds simple but I found it fiendishly difficult.

The Over-8s disc is intrinsically different in that the first seven games all provide a keyword – if completed – and this is used in the last program on the disc. Again you can see that some of the games are progressions from earlier discs – Build a Bridge from Packing, Passage of Guardians from Maths Maze.

Build a Bridge is more complicated than its predecessor in that triangular shapes may need to be turned over for correct placing. In Passage of Guardians you are asked to solve anagrams instead of sums – some are very difficult. However, it also suffers from a too frequent repetition of certain words. Unicorn combines a simple maze/coordination game with the old fox/hen/corn conundrum. This one took the children quite a long time to solve.

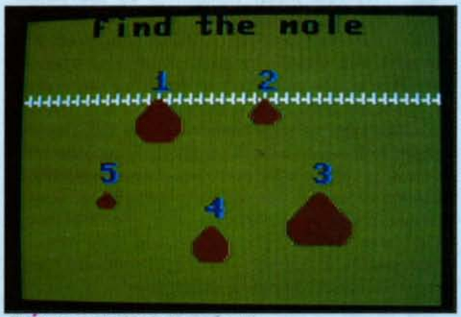
Logic Doors had my brightest fourth year juniors stumped for quite some time. A maze game requiring careful mapping is made deviously difficult by the introduction of one-way doors which are different colours on each side. Furthermore to gain a keyword it is necessary to play a second time using the keys. This is much more difficult, as the route needs to be planned in advance to make sure you have all the necessary keys to finish.



Souvenirs, on the other hand, was refreshingly simple. Your task is to travel to various European countries, spending money in each one and returning with a souvenir from each. This nice introduction to geography requires some idea of how to work out simple ratios.

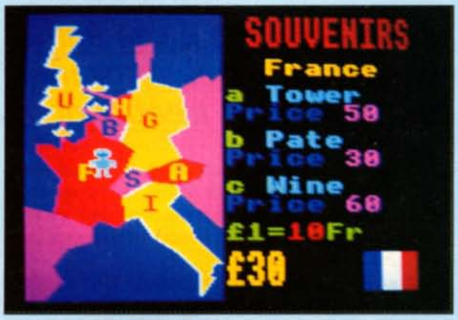
Code Boxes involves something which few primary schools cover: Binary. This really stretched the eldest and after a lot of guesswork plus trial and error they worked out how 10 equals two and 100 is four.

The penultimate challenge is Mystery Machine, with knobs to turn, levers to pull and a key. All are coloured and must be moved in the correct order, while the instructions are in code. But by now the whole class were dab hands at problem solving and soon had everything operated.



Find the mole from the selection of programs for Under-6s

Last comes Escape, yet another maze with horrifying memories of Logic Doors. Again careful mapping is needed. Here is where you must use the collected keywords, but beware of backtracking, as words can only be used once. Respond with the correct keyword at each stage and you have finished – rather an anti-climax, but only because there was no more to do.



Souvenirs – from the Over-8s suite – gives a nice introduction to geography

The children – and staff – found Fun School 2 great educational entertainment. It's a must for anyone with children and a BBC Micro.

Summing up

The true test of educational software is pupil reaction: Fun School 2 will take some beating simply because all ages and abilities are challenged and, most importantly, they enjoyed the games. These programs have become the number one choice in our school with both teachers and pupils. All I can add is here's looking forward to Fun School 3.

Speaking man to micro

Ken Down continues his look at the Wimp, and opens a dialogue with it

SOMETIMES a program needs to clarify a point or tell us something, and for this we need one of the more confusing features of the Wimp Manager – dialogue boxes. According to the Programmer's Reference Manual there is no direct way of setting up dialogue boxes under the Wimp. However, the perversity of human nature being what it is, we needed – and found – a way to do it.

The method, using icons, is simple to set up but not so easy to decode. This month we shall concern ourselves with preparing them, leaving the rest until the next issue.

What we do is read the necessary information from data statements stored from line 20000 onwards. This is the best way, because different dialogue boxes have different numbers of icons. Attempting to transfer the required information to the procedures that create and control the dialogue box in any other way would prove tedious and lengthy.

The first data item is the name by which the dialogue box is to be identified – part of the technique we shall use to decode the dialogue clicks. The second item gives the number of icons in this particular dialogue box. After that comes the width and the height of the box in normal graphics units.

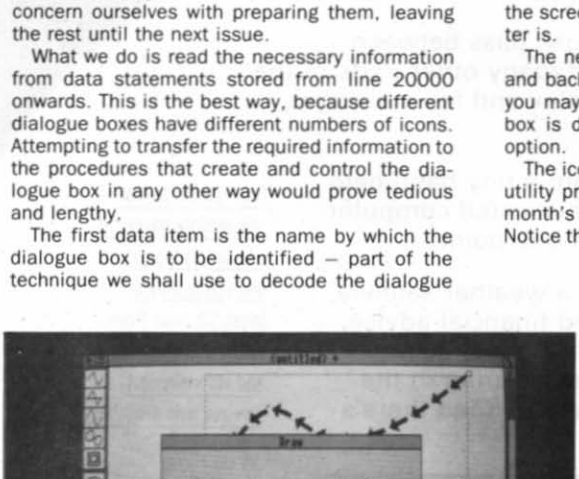
Subsequent data statements give the necessary information to enable the program to create the icons. The first four items in each line define the bottom left and top right corners of the icon relative to the bottom left of the dialogue box. This is because the box may appear on any part of the screen, depending on where the mouse pointer is.

The next two items give the icon's foreground and background colours. This is useful because you may wish to highlight one button when the box is displayed, indicating it is the preferred option.

The icon flag comes next, and you may use the utility procedure PROCdecodeicon(x%) from last month's issue to find out what &303D stands for. Notice that the icon flag in line 20030 is 2, which

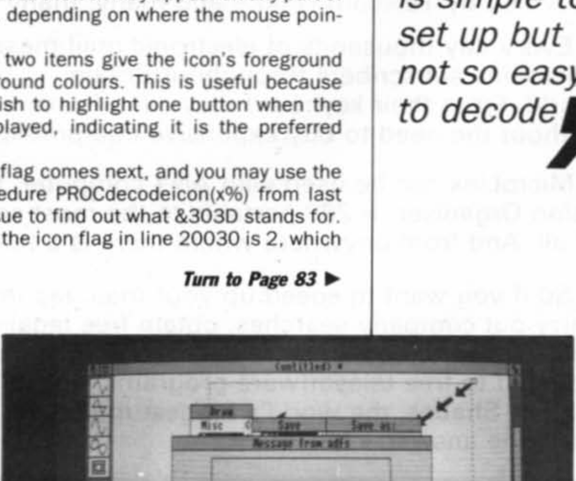
Turn to Page 83 ►

The method, using icons, is simple to set up but not so easy to decode



Do you want to save your edited file?

Choose your answer



Please insert disc 'WELCOME'

Risc OS message box

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Racing tips
Online chatting
Teleshopping
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Typesetting
Airline schedules
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◀ *From Page 81*

states that this particular icon is a sprite. If you designed the sprites recommended last month and gave them any name other than warn and stop, you should substitute your preferred name at the end of line 20030.

The last data item may take one of four forms. A string, such as *Proceed* or *Stop* is interpreted as either the wording to be displayed inside the icon or as the name of the sprite that the Wimp Manager must look for.

Later, when we come to flesh out the bare bones of this window program with the accounting details, we shall want to put icons on top of icons. We shall use a function to do this, so you may make this last item a function name.

If we want to input some information we need one of the icons to be writeable – the buzz word for an icon or window that can be written to. In this case the final data item takes the form *"buffer%,length%"*. The quotation marks are important because otherwise Basic spots the comma and interprets it as two items, which leads to some interesting results. The variable *buffer%* points to an area of memory where the input string can be stored and *length%* is the maximum length of the input string.

The final form is simply a string variable such as *a$* or *b$*. The string variable may be an element of an array such as *a$(0)* or *b$(i%)*. In such a case the program substitutes the contents of the string for the icon wording. Here's our data statements:

```
20000 DATA warn,3,460,200
20010 DATA 40,60,1,1,0,0,2,stop
20020 DATA 220,120,420,180,3,0,&303D,Proceed
20030 DATA 220,20,420,80,1,0,&303D,Cancel
```

Now comes the function that creates the dialogue box:

```
1800 DEFFNcreatedialog(col%)
1810 LOCALnicons%,width%,height%,x%,y%,i%,h%,
bx%,by%,tx%,ty%,bg%,fg%,flg%,i$
1820 MOUSEmousex%,mousey%,but%
1830 READclaim$,nicons%,width$,height%:width%
=EVALwidth$
1840 x%=mousex%:y%=mousey%-height%
1850 h%=FNcreatewindow("",&90,0,col%,width%,h
eight%,x%,y%,x%+width%,y%+height%,0)
1860 FORi%=1TOnicons%:READbx%,by%,tx$,ty%,bg%
,fg%,flg%,i$:ty%=EVALty$
1870 IFLEFT$(i$,2)="FN"a$=""ELSEIFINSTR(i$,"$
")a$=EVALi$ELSEa$=i$
1880 PROCcreateicon(h%,bx%,by%,tx%,ty%,bg%,fg
%,flg%,0,a$)
1890 IFLEFT$(i$,2)="FN"j%=EVALi$
1900 NEXT
1910 PROCopenwindow(h%,block%):PROCmouselimit
(block%!4,block%!8,block%!12,block%!16)
1920 =h%
```

Notice that its first part creates a window at the mouse pointer position, using the size information in the first data statement. This window is given a flag value of &90 which means that the window can be redrawn entirely by the Wimp Manager and has no quit or back boxes, scroll bars or indeed any borders at all.

Once the window has been brought into being, line 1880 calls PROCcreateicon to make the required number of icons:

```
2000 DEFPROCcreateicon(window%,bx%,by%,tx%,ty%
,bg%,fg%,flg%,esg%,data$)
2010 LOCALi%
2020 !block%=window%:block%!4=bx%:block%!8=by%
2030 block%!12=tx%:block%!16=ty%
2040 block%!20=flg%OResg%<<16ORfg%<<24ORbg%<<2
8
2050 IFblock%!20AND&100THEN
2060 i%=INSTR(data$,","):block%!24=EVALLEFT$(d
ata$,i%-1)
2070 block%!28=-1:block%!32=EVALMID$(data$,i%+
1)
2080 ELSE
2090 $(block%+24)=LEFT$(data$,11)
2100 ENDIF
2110 SYS"Wimp_CreateIcon",0,block%
2120 ENDPROC
```

Note that owing to the way the procedure is structured, it is not possible to have a dialogue window

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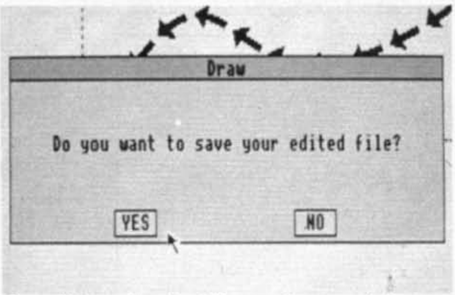


Do you want to save your edited file?

Every dialogue box should have at least one button

ACCESSING SYSTEM SPRITES

Under the Risc OS there are a whole selection of sprites available from rom, plus a common pool. Getting at them is quite simple. First a new command is available from the Wimp called by:

```
SYS "Wimp_BaseOfSprites" TO romAddr,ramAddr
```

The rom section contains a whole pile of sprite goodies such as standard file type icons, error symbol, tick, tick in a box, cross in a box, floppy disc, hard disc and so on. In addition, the ram area is where icons for data types created by other applications are located. You can load your own sprites into this area, if you need to, with:

```
*IconSprites spritefile
```

It is important to find out the address of the ram sprite area every time you access it because its address may change. To allow sprites to come from a variety of sprite areas the four data words that describe an icon – four bytes each – have been extended:

Icon flags	Bit 1 icon contains a sprite Bit 8 icon data is indirected
Pointer	To sprite name or its pointer
Area	Address of sprite area to use If –1 use sprite area indicated by window definition
Name length	If =0 pointer is offset into sprite area If >0 pointer is address of sprite name

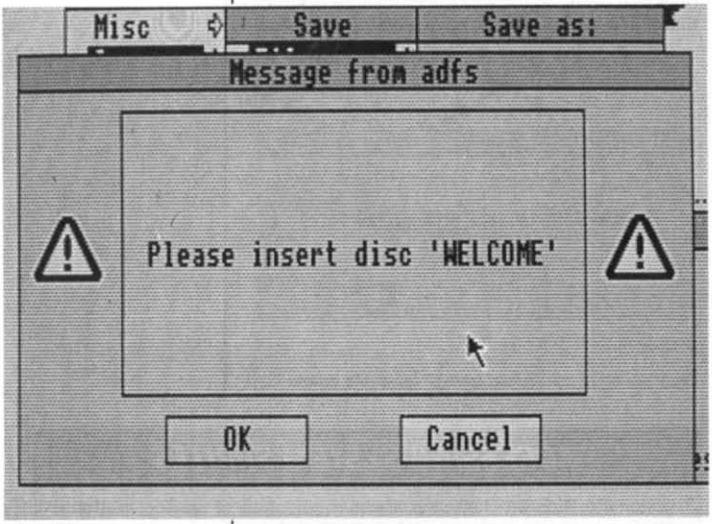
There are also facilities to have an icon composed of both text and sprites, and even two sprites which are swapped when selected. However the requirements and variations on these are quite complex.

◀ *From Page 83*

with no icons at all – you'd be stuck if you managed to make one.

The window is then opened and the mouse is confined within the limits of the window, thus forcing you to click one of the buttons before proceeding. By now you should be able to make some sense of this function. The first four bytes of the memory block contain the handle of the window in which the icon appears. The next 16 contain the coordinates for the bottom left and top right corners of the icon.

The icon flag – *block%!20* – can be calculated using PROCiconflags. However, for ease of use we have separated the foreground and background colours, and the exclusive selection group number from the other parts of the flag. This means that if you do use PROCiconflags to calculate it you should answer 0 to the questions on these points.



Message from adfs

Please insert disc 'WELCOME'

Select from the icons

The icon data block from byte 24 onwards has room for 12 more bytes which contain either 11 characters of text or the name of a sprite – in both cases terminated by Ascii code 13. Alternatively, the first four may contain the address of the buffer where the icon's text is stored. In this case the four bytes after the address should contain –1 and the four bytes after that tell the Wimp how long the buffer is.

Line 2050 checks to see if bit 8 of the flag is set, in which case the wording in the icon is indirected and block%!24 will contain an address. Lines 2060 and 2070 put –1 in block%!28 and the length of the buffer in block%!32.

Finally the Wimp Manager routine *Wimp–CreateIcon* is called with the address of the parameter block in register *r1*.

We'll round things off for this month with the procedure to limit mouse movement to the dialogue box.

```
2200 DEFPROCmouselimit(x%,y%,x1%,y1%):MOUSEREC
TANGLEx%,y%,x1%-x%,y1%-y%
2210 mbx%=x%:mby%=y%:mtx%=x1%:mty%=y1%:ENDPROC
```

RISC OS DIALOGUES

To facilitate the creation of dialogue boxes the Risc OS has brought in a new button type, number 11. The button type is a number from 0 to 15 which is located at bits 12 to 15 of the icon flags. This new one automatically inverts the icon when it is clicked and also notifies the program.

Another good choice is button type nine, which inverts the icon when the pointer is over it – re-inverting when it moves away – and informs the software when a button is clicked.

This is all very well, but what are we going to do with the dialogue box? As we mentioned when we learned how to decode the menus, switching to VDU4 was not good practice. Let's replace one of those VDU4 statements with a call to make a dialogue box. Type in these lines to replace the originals:

```
10100 DEFPROCone:IFpoll%!4=-1OR(poll%!4=1ANDpoll%!8=-1)THEN
10110 VDU7:RESTORE20000:dialog%=FNcreatedialog
10120 ELSE
10130 VDU4:IFpoll%!4=0THEN
```

If you click option two on the menu instead of selecting from the sub-menus the program should beep and present you with a white dialogue box containing two buttons, one yellow and the other red. Clicking on these does nothing, we need to go back and make a few alterations to the earlier parts of the program:

```
5040 COLOUR12,180,150,100
5041 COLOUR13,254,180,80
5042 COLOUR14,255,230,0
5043 COLOUR15,180,180,180
5050 COLOUR143:CLS
5060 dialog%=0

2660 IFbutton%=4IFdialog%PROCclickdialog(poll%!16)
```

Now when you click on option two you should get a *No such FN/PROC* message. It's not much, but at least it's something.

In fact this is quite a useful program development technique: When decoding menus or dialogue boxes put in the name of the procedure or function that's going to do the job, but don't write it or even put in a dummy of it. So if you forget that you haven't written it – easy to do in big programs – you get an error message when the program crashes telling you exactly what you've missed.

Anyway here's PROCclickdialog – but you'll get the same message even when you type it in because it calls an unknown function – the one that actually responds to your click on the buttons. But that, as they say, is another story:

```
2300 DEFPROCclickdialog(icon%):IFclaim$=""ORic
on%=-1ENDPROC
2310 IFEVAL("FNclickdialog"+claim$+"(icon%)")T
HEN
2320 PROCclosewindow(dialog%):PROCmouselimit(0
,0,1279,1023)
2330 claim$="":dialog%=0
2340 ENDIF
2350 ENDPROC
```

● *Next month we'll take a look at that elusive function and put speech into the dialogue box.*

Learning has never been such fun!

fun school 2

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A colourful button badge with each package!

Fun School 2 for Under-6s contains:

- ***Shape Snap:*** *Colourful shape recognition*
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- ***Teddy Count:*** *Ideal introduction to numbers*
- ***Write a Letter:*** *Creative fun at the keyboard*
- ***Colour Train:*** *Play at spotting colours*
- ***Pick a Letter:*** *Word building made easy*
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Fun School 2 for 6 to 8 year olds contains:

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- ***Shopping:*** *Which shops for which products?*
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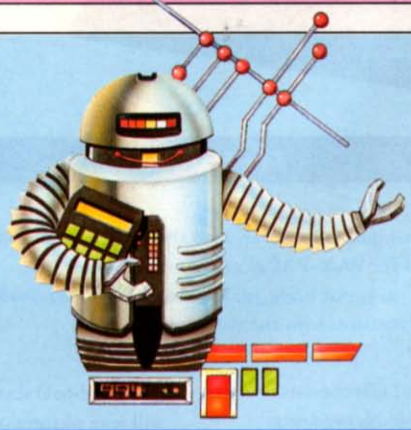
- ***Packing:*** *Discover tesselating shapes*
- ***Caterpillar:*** *Word building challenge*
- ***Number jump:*** *Have fun practising tables*



Fun School 2 for Over-8s contains:

- ***Build a Bridge:*** *Shape-fitting challenge*
- ***Passage of Guardians:*** *Enjoy anagrams*
- ***Unicorn:*** *First steps in problem solving*
- ***Logic Doors:*** *Mapping made easy*
- ***Souvenirs:*** *An introduction to travel*
- ***Code Boxes:*** *Discover binary arithmetic*
- ***Mystery machine:*** *Have fun breaking codes*
- ***Escape:*** *A final check on progress*

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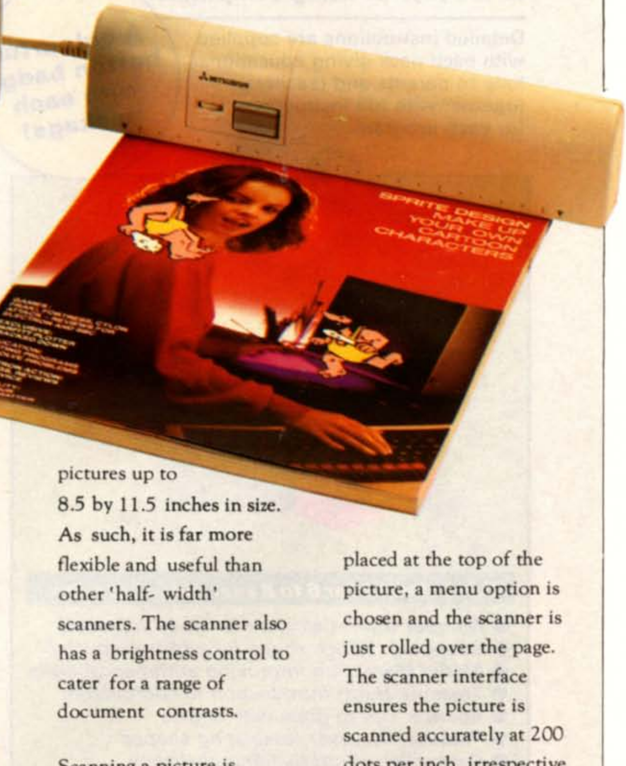
MU4

TVM
Scan-Light | File | Scan | Edit
'Largepic' at 100%

S·C·A·N LIGHT

The scanner, interface & software for the Archimedes



The Hardware

Scan-Light is based around the scanner interface used for FAX-PACK and provides a low cost way to input high quality scanned or 'digitised' text and pictures into the Archimedes.

Scan-Light consists of a half-width expansion board (that will fit into any Archimedes), on board ROM software and an 8.5 inch 200 dpi scanner.

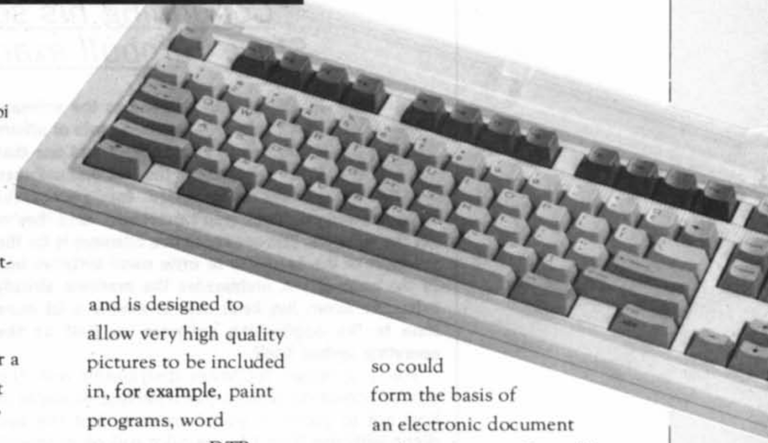
The hand-held scanner will scan pictures or text from loose pages, photographs and books, and because of its full A4 width it will scan complete A4 pages of text or pictures up to 8.5 by 11.5 inches in size. As such, it is far more flexible and useful than other 'half- width' scanners. The scanner also has a brightness control to cater for a range of document contrasts.

Scanning a picture is simple; the scanner is placed at the top of the picture, a menu option is chosen and the scanner is just rolled over the page. The scanner interface ensures the picture is scanned accurately at 200 dots per inch, irrespective of the scan speed.

Completely compatible with Arthur and the new RISCOS operating systems. It can, for example, run on the RISCOS desktop, where it can create files for direct use in the RISCOS paint or draw programs. These programs would allow the pictures to be edited or altered in an infinite number of ways.

28 days 'no quibble' money back guarantee, in addition to the normal 1 year parts/labour guarantee and free software update service.

The Software

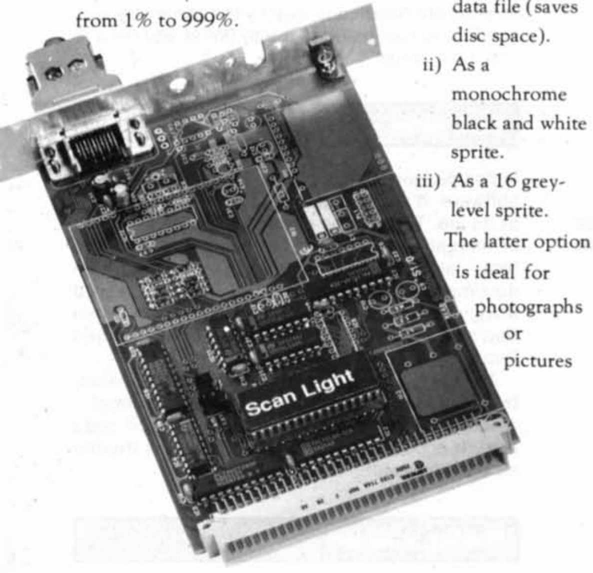


All the necessary scanner controlling software is included on a ROM as part of the scanner interface — it does not require a disc.

The software is WIMP based which makes it very easy to use, with all features being controlled by menu options. These features include:

- The currently scanned page is viewed within a window, which can be scrolled and re-sized like all windows.
- It is possible to 'zoom in' or 'zoom out' so the scanned image may be viewed at any size or scale from 1% to 999%.
- Pixel editing facilities allow individual 200 dpi pixels to be drawn or 'undrawn'.
- Printer drivers are included to print the image to a variety of dot-matrix, inkjet and laser printers.
- The scan can be either a monochrome scan (best for text) or a 'half-tone' scan (best for pictures).
- The image may be viewed either as a monochrome, or 16 grey level picture.
- The whole image, or any selected part, may be saved in a variety of ways:
  i) As a compressed data file (saves disc space).
  ii) As a monochrome black and white sprite.
  iii) As a 16 grey-level sprite.

The latter option is ideal for photographs or pictures and is designed to allow very high quality pictures to be included in, for example, paint programs, word processors or DTP programs.



Scan-Light is equally suited to capturing photographs from magazines, diagrams or printed text from books, or hand written notes or signatures. An entire A4 page can be scanned into the computer and then filed away on disc to be recalled later (so it can be viewed, subsequently edited or re-printed) and so could form the basis of an electronic document archiving system. It could also be used to build libraries of pictures or diagrams for future reference.

Scan-Light, in conjunction with the outstanding graphics facilities available on the Archimedes, finally takes computers away from their text only backgrounds, into a world where they can handle text and pictures with equal ease.

Hardware and Software runs on Arthur and RISCOS operating systems, requires 1 MByte machine.

Price £449.00 + VAT for scanner, interface board & software.

Computer Concepts Ltd

Gaddesden Place, Hemel Hempstead, Herts HP2 6EX
Tel: Hemel Hempstead 0442 63933

Access & Barclaycard welcome.

No risks with these discs

Continuing his series on the Risc OS, Steve Turnbull examines the free software

MICROS are only as good as the software that's written for them, a state of affairs applicable to all machines and one that is not improved by the fact that software houses only write for successful machines and machines aren't successful until they've got the software. The answer to this dilemma is for the producer of the hardware to write some software too. In the case of the Archimedes the machine already exists, so Acorn has been able to devote a lot more time to the application software as well as the operating system itself.

The bug-ridden ArcWriter distributed with the earlier operating system was a perfect example of how not to promote your hardware, but the two discs with the Risc OS are brim full of excellent software. The contents are summarised in Tables Ia and Ib.

Sprite editor

The original Arthur sprite editor was written in Basic and while satisfactory it wasn't great. Well !Paint is amazing. When loaded it installs itself on to the icon bar, and clicking its symbol initially brings up an example file – you can edit as many sprite files as the Wimp can handle windows, currently 48.

Program	Description
!Config	Set system parameters
!Draw	Object-based drawing program
!Edit	Text editor
!FormEd	Window template designer
!Help	Interactive help utility
!Paint	Sprite editor
!PSPrinter	PostScript printer driver

Table Ia: Application software on disc one

Program	Description
!65Host	BBC B front-end emulator
!AClock	Window-based clock
!Alarm	Icon bar-based alarm clock
!Calc	Calculator
!Lander	The game
!Madness	Wait and see
!Maestro	Music composition and playing
!Magnifier	Screen examination
!MailMan	Network message handler
!Patience	Window-based game of patience
!Puzzle	Window-based sliding block puzzle
!TinyDirs	Quick find directories
!Usage	ARM chip usage graph

Table Ib: Application software on disc two

A file window contains all the available sprites in this file plus its name. Each is scaled to the same size, using the now standard sprite scaling facilities. A menu can be brought up allowing you to save the file, create a new sprite, copy, delete, rename or delete the current sprite.

Double clicking a sprite generates a window containing it magnified three times and you can alter the proportions to anything between 999:1 down to 1:999 – that's roughly 1,000 times larger to a 1,000 times smaller. And all in real time.

You can select a window to control which colour your editing options operate with – there's one such window for every sprite you're editing, and another that contains icons representing the operations you want to carry out.

Imagine a good quality screen design package with all the usual drawing facilities: Shapes – filled and unfilled, lines, paint brush, spray can, text, screen move and copy. With !Paint you get all those options and can use them on sprites plus the ability to bring up several views of the same one and edit them at different magnifications.

The final bonus is that complete graphics screens are handled in exactly the same way and to edit one you just load it into !Paint and treat it like a big sprite.

Text editor

In comparison !Edit is quite a pedestrian piece of software. It's only a text editor, but it is excellent at its job. Text can be entered from the keyboard or merged from another file using any available font – although only one at a time for the whole document. This, or a portion of it, can be saved using the normal icon drag method but when that's been done once you can just press f3 then Return.

Any code from 0 to 126 can entered – characters less than 32 are simply typed in as Control+ a letter, for example Control+@ is Ascii code zero. It appears as [00] in the text but is treated as one character.

Making windows

The !FormEd package is a very useful addition for programmers, although my early version contained a few bugs. It allows you to design the

Drawing package is a lovely mover

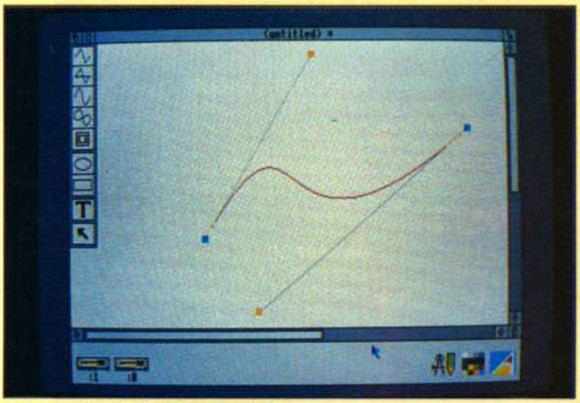
How do you describe a piece of software that lets you draw standard shapes, rectangles, and ellipses, in any colour plus curves of any description? And it then permits you to modify them, changing size, rotating by any angle, altering curvature, shifting and copying them, and deleting with tremendous ease.

The package allows you to group several objects together so that subsequent operations act on the whole group. It permits lines to be of any arbitrary thickness, dotted, dashed, have square or rounded ends, even arrow heads of any size.

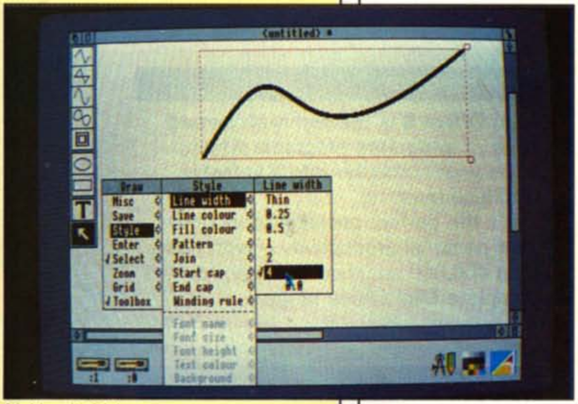
Text can be the system font or an anti-aliased one – in which jagged edges are smoothed, improving its appearance – typed in direct or loaded from disc and saved back out as an Ascii file. It can be altered in size directly, too. Sprites can be loaded directly – or saved – for more detailed work in the !Paint program.

Its power stems from a new built-in module called Draw which has facilities for plotting paths which can consist of various elements including the lines, curves and further sub-paths. The module supports a number of SWI calls that allow you to interact directly and include these graphic operations in your own programs.

The Draw module also uses the floating point emulator, so when the fp chip becomes available A440 owners will get lightning fast curve drawing – and it's not slow now. In fact there's nothing like it at all on the Archimedes at present – even the expensive MacDraw on the Macintosh is hard pressed by the quality of this free program.



A Bezier line in the !Draw package



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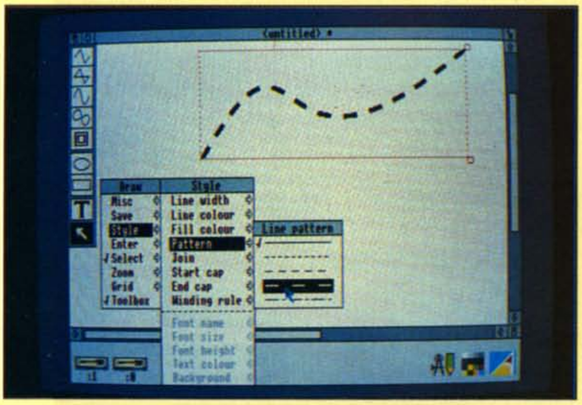
Making it thicker



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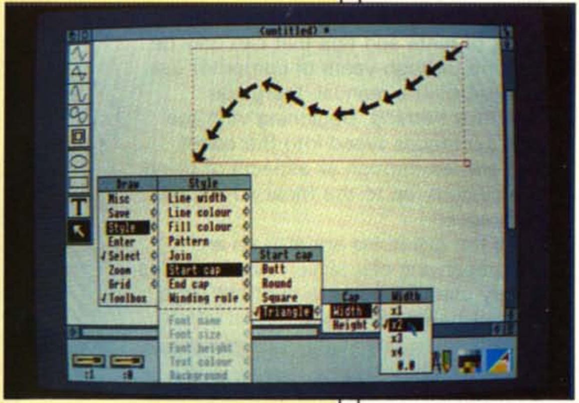

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√x2
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windows and save them as templates which can be loaded directly into your programs without the need for complex window definitions.

The final program we'll look at on the first disc is !Config. This simple piece of software allows you to preset the configure options for your machine. Despite the flexibility of the Risc OS memory management, it is quite handy to set such things as initial font size and so on. Mouse sensitivity, keyboard repeat speed and overall

Turn to Page 91 ▶

THE PERFECT PAIR

The best-selling, award-winning BBC software is now joined by THE definitive guide

A Dabhand Guide
BRUCE SMITH
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BBC B B+ Master Series version
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DATABASE SOFTWARE

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Mini Office II is the highly-acclaimed suite of integrated programs which turns your computer into a versatile business machine.

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The Dabhand Guide to Mini Office II is a brand new book to help you get the most out of the software. It not only contains the facts, but also the kinds of hints and tips that can only be built up through years of computer use.

More than a manual, the guide assumes nothing. Beginning with the first sentences typed into the editor, you are led through all aspects of using the system, up to the most advanced techniques.

All the examples are also on an accompanying disc which even includes a very useful routine to print out large spreadsheets sideways.

What's more, when you buy Mini Office II and the book together we'll knock £5 off the combined price!

BBC version

WORD PROCESSOR: Compose a letter, set the printout options using embedded commands or menus and use the mail merge facility to produce personalised circulars.

C64 version

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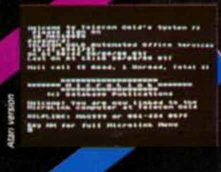
Amstrad version
Mini Office II
Label Printer

LABEL PRINTER: Design the layout of a label, select any label size and sheet format, read in files from the database module and print out in any quantity.

C64 version
Rent
Telephone
Salaries
Postage
Others

GRAPHICS: Produce pie charts, overlay line graphs and display bar charts side by side or stacked. Enter data directly or load data from the spreadsheet.


Atari version

COMMUNICATIONS: Access services such as MicroLink and Telecom Gold, send electronic mail, telex, fax and telemessages in a flash or order a wide range of goods.

Please turn to the order form on Page 135

◀ *From Page 89*

volume control can also be initialised, along with the printer port and whether you want the instant effect windows.

The second disc

Where the first batch of software was composed of serious software, the other is in a much lighter vein, containing the original !Lander game now redesigned for the Risc OS – the game's the same, but it now has a pretty icon. Other games include !Puzzle and !Patience The latter is very nicely written and the ease of re-dealing makes it quite addictive.

!Maestro is an upgrade of the earlier music composition program and is now easier to use, while !MailMan is a utility for Econet users for sending and receiving messages. !Magnifier is a simple Basic program – just over 2k long – which displays a portion of the screen as a magnified sprite inside the frame of a magnifying glass.

There are two dissimilar clocks: !AClock brings up a window with an analogue clock in it – adjusting the size of the window changes the clock so that it always just fits. !Alarm installs a clock face on the icon bar and repeatedly redraws the hands so that it shows the correct time. If you wish you can alter it to a digital readout and specify your own format.

Any number of alarms can be set up, either one-offs or repeating – complete with a message automatically displayed at the appropriate time. However there's a lot more to !Alarm than that. Other applications can request the program to send them a message at a given time too, so it becomes the alarm feature for the whole machine – another example of the isolation of function within a multi-tasking desktop environment.

!Usage is interesting in that it displays a graph of how much processor time is being occupied by all the applications. It works by measuring the time between successive polls of itself by the Wimp.

The desire to have major applications plus innumerable little utilities loaded at the same time can cause problems with insufficient memory. A useful way of sidestepping this is !TinyDirs, which allows the icon of an application or utility to be put on the icon bar without loading the program itself. Then double clicking the icon loads and runs the software required. If a change of disc is required it will be requested.

● *In the final part of this series, we'll examine more of the software innovation that makes Risc OS probably the best operating system on a micro.*

Availability

The new Risc OS from Acorn will not be available until April and this series of articles has been written using a preview version. Also the disc software has not been finalised.

The new operating system, complete with four roms, two manuals and two discs packed with software, will be available for just under £30.

The truth about TELEX

How much does it cost to go on Telex?

You could go the conventional way and buy a dedicated Telex machine. The cheapest will cost you £1,604 (the Whisper), the dearest £2,892 (the Cheetah). You will also need a separate telephone line, costing £101 to install, plus £404 a year rental. That's a total outlay over the first year of a minimum of £2,109. (All prices include VAT.)

Or you could do what more and more BBC Micro users are doing – use your BBC Micro to double as a Telex machine. And just use your ordinary telephone!

How do I turn my BBC Micro into a Telex machine?

All you need is a modem and appropriate communications software (see the advertisements in this issue), a telephone, and a subscription to *MicroLink*.

Telex is just one of a growing number of services available to micro users on *MicroLink*. You can also read the news as it happens, go teleshopping, create your own closed user group, send telemessages and electronic mail right round the world, download free programs directly into your micro . . . and much more.

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Because it's a standard means of instant communication between businesses. Today there are 150,000 Telex machines in use in Britain – and more than 2 million worldwide. It's used to dramatically speed up business communications – it's just as quick as using the phone but far more efficient, because you have a hard copy of every "conversation" for your records.

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With *MicroLink* you don't HAVE to be in your office to send or receive Telex messages. You can just as easily use your computer at home (or even a portable). So now you can check whether there are any Telex messages waiting for you – anywhere, anytime. How's that for your business efficiency?

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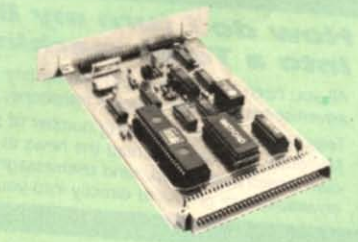
With this interface it is possible to connect almost any 5¼"/3½" disc drive with its own power supply to the Archimedes. NO SOLDERING is involved. Supplied complete with necessary lead.

Only £21

Note: This is not simply a lead. Attempting to connect an external disc drive by direct connection may result in damage to your Micro.

New

Watford's 20Meg Archimedes Hard Disc



Watford Electronics' 20Meg hard disc fits internally into the Winchester slot provided. It is fully compatible with Acorn's hard disc upgrade, (the only difference is our low price). Price includes the Hard Disc Drive, Controller Podule & fitting instructions.
P.S. This upgrade requires a backplane and a fan.

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Backplane for 4 Podules	£38
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FREE . . . £35 worth of Software

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Delta 3B Single Joystick	£10
Delta 3B Twin Joysticks	£15
Delta 3C Joystick for Compact	£10
Delta 14B Single Joystick	£11
Delta 14B/1 Adaptor Module	£12
Transfer Software Disc-Tape	£7

ATTACHE CARRYING CASE

For the BBC Micro. Attractively finished in antique brown leatherette. Lockable.
Only **£10** (£2 carr.)

CO-PRO Adaptor

CO-PRO ADAPTOR

With this Watford's Co-pro Adaptor unit, you can now attach any BBC Master's coprocessors to your original BBC B.
Use the super fast Turbo Board with your BBC B, it is much faster than the 6502 2nd processor superseding it.
With the 512K addon your standard BBC machine achieves IBM PC compatibility at a realistic price running GEM, Lotus 123 and many other programs. Included with the 512k package is a high precision mouse and the Digital Research GEM suite of software; GEM Desktop, GEM Write GEM Paint. This requires both the 1770 DFS and the ADFS to be fitted to your computer.
To use other co-processors you require a BBC B with DNFS 1.20 or higher, or BBC B+ fitted with 1770 DFS 2.20 or greater. Co-processors work exactly like a second processor.
Master owners may use Co-Pro Adaptor to add a second Co-processor externally.
Watford, brings power to your BBC at only:

£35 (carr £5)

REPLICA 3

This new improved REPLICA 3 from Clares is a very powerful disc based TAPE to DISC Utility. It now transfers even more programs than ever before. Replica 3 will not work with all programs but then neither will anything else. 30,000 Replicas have been sold to date. It has to be good.

£15 (40 or 80 track)

Acorn's Speech Synthesiser package, complete

Special Offer £18

Versatile BEEB SPEECH SYNTHESISER Unit

Beeb Speech Synthesiser

The Watford Speech Synthesiser is a very flexible speech synthesis unit based upon the powerful phonemes system. This system stores the building blocks of speech (called phonemes) and allows you to combine them quickly and easily to form virtually any word imaginable.

Supplied with an advanced ROM, you are provided with a 500 word dictionary to get you started. These can easily be added to by following the notes given in the comprehensive manual.

SPECIAL PRICE £32 (carr £2)

65C102 2nd PROCESSOR

This amazing package consists of the Acorn 65C102 'Turbo' Board, the Watford Co-Pro Adaptor and Acorn 1.2 DNFS ROM. The 'Turbo' board, running at 4MHz with 64k of additional RAM will increase the speed by between 50 and 200% depending on the application running, and allow a BASIC program of upto 44k in any screen mode. Simply by plugging in the Co-Pro and the DNFS ROM with its special Tube host code and you massively increase the power of any Model B. This is a complete package, with its own power supply, ready to interface with your BBC Micro.

£159

By Popular demand we are now supplying refurbished and fully guaranteed BBC Micro Model B with Disc Filing System

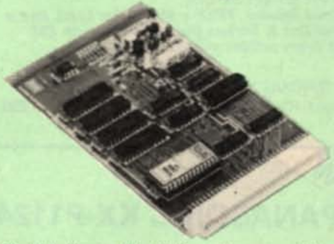
(Please telephone for price & availability)

The 80186 Co-Processor

This package consists of the Master 512 board, Watford Co-Pro Adaptor, 1770 Disc Upgrade and Acorn ADFS. This is a complete package, with its own power supply, ready to interface with your BBC Micro. The Master 512 board using the 80186 16 bit Processor at 10MHz and running Digital Research DOS Plus, gives a high degree of IBM compatibility at an extremely reasonable price. Included in the 512k package is a mouse and the amazing Digital Research GEM suite of software; GEM Paint, GEM draw and GEM desktop giving a complete Mouse Icons environment (All other GEM packages will work on the 512k). Famous packages that will work with the 512k board include Wordstar, Dbase II, Lotus 123 and many others. The only requirement to upgrade any BBC Model B to this system is you must have twin 80 track disc drives.

New low price **£219**

Archimedes Real-Time Digitiser



Watfords' Archimedes Video Digitiser is the most sophisticated digitiser ever designed for a micro. It provides a fast and flexible means of capturing images from a video camera or recorder for display and manipulation on the Archimedes range of Micros. Off-air television signals may also be digitised via a video recorder or TV tuner.

Once captured, Video images can be stretched, squahsed, rotated, stored on disk, printed, or used by applications software.

Applications include desktop publishing, graphics, animation, image analysis and recognition, medical imaging, automatic inspection and measurement, databases, interactive video, remote transmission of pictures via a modem, movement detection ... or anything else you can think of!

SPECIFICATION

SOFTWARE

All the driver software for the digitiser is contained in a ROM on the podule. Facilities provided include:

- Grabbing of images to the screen or dumping to memory.
- Continuous grabbing and display for previewing or camera alignment.
- 'Hot key' grabbing – pressing a (configurable) key combination grabs and displays an image on the screen while another program (e.g. paint software such as Artisan) is running.
- Scaling (zoom/shrink) any section of an image to any size in X and Y directions, with optional X/Y flip, window clip and logical (AND/OR/XOR) plotting.
- Rotation and scaling to any angle and size, rotating about any point, with optional window clip, and logical (AND/OR/XOR) plotting.
- Very versatile matrix printer screendump facility for Epson FX, LQ and EX compatible printers – pictures can be printed to ANY size (including multiple sheets) at any orientation, using any available printer density and one of six internal sets of dot patterns, or with user definable patterns (pattern editor supplied). The screen-dump can also be used for general purpose graphics screen printing.
- Pixel value lookup tables: pixel values can be passed through a user defined lookup table to allow contrast enhancement, thresholding pseudo-colouring etc.
- Smoothing and noise spot removal to enhance image quality.
- Creation of sprites from all or part of a digitised image.
- Saving and loading of digitised images in compressed format.
- Combination of pictures by adding, avaraging, subtracting, multiplication etc.
- Much faster versions of the Arthur *ScreenLoad and *ScreenSave commands.

Software facilities are accessed via operating system star (*) commands and SWI calls. High resolution screen modes using MultiSync type monitors are supported.

UTILITY DISK

A disk is included, containing sample pictures, examples and utility programs including the following:

- Colour image grabbing using colour filters with monochrome or colour cameras, including colour balance adjustment and scaling facilities.
- Pattern editor for 2 colour display modes and printer screendumps.
- 512 line interlaced display for non MultiSync monitors.
- Thresholding to create two colour images.
- Capture and replay of animated sequences.
- Several example programs illustrating the use of digitiser software.

RESOLUTION

Images are digitised to 512 (h) x 256 (v) pixels, and then scaled to fit the Archimedes' screen. It is possible to digitise to 512 x 512 pixels if the picture is stationary for about 0.1 second. 512 x 512 images can either be displayed on a MultiSync monitor, or on a normal monitor using interlacing.

Pictures are digitised to 64 levels of grey (6 bits). Note, however, that it is only possible to display all 64 levels on a monochrome monitor, or a colour monitor which has a composite (CVBS) input. For this reason, the Philips CM8533 monitor is recommended instead of the standard Archimedes monitor. It is also possible to connect both a colour and a monochrome monitor at the same time.

Any 2,16 or 256 colour graphics mode can be used to display digitised pictures. In two colour modes, grey levels are represented using dot patterns, which may be redefined if required (a pattern editor is supplied).

Cont.

SPEED

Video fields are captured in real time (1/50th sec.), and then transferred to Archimedes' memory or the screen. The grab/display rate is dependant on the screen mode and picture size, up to 25 fields per second for quarter screen images, or 12.5 per second for fullscreen (Mode 9).

HARDWARE

The digitiser is a single width podule, with a BNC socket on the rear panel for the video input, which may optionally be terminated via a link. There is 128K of on-board memory to store the digitised image, and a 32K ROM on the podule contains all the driver software.

Automatic video level control and black level clamping circuitry is used to ensure that the optimum contrast is obtained from a variety of video sources. A filter is included to avoid patterning effects when using colour sources.

Price £249

Z88 Sinclair's Portable Micro

The worlds first, truly portable Micro. It is A4 size, only an inch thick and weighs under 2lbs. Ideal for use when travelling or as a personal organiser.

Only: **£199**

FREE

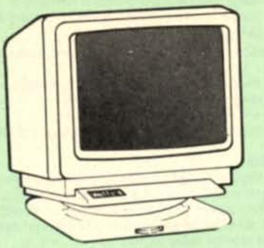
With every Z88 purchased from us this month, we are giving away absolutely FREE, a Z88 to BBC Interface Link, 4 rechargeable batteries and a compact Mains Battery Charger worth £38.

ACCESSORIES

Mains Adaptor	£8.65
32K RAM Pack or 32K EPROM Pack	£17.35
128K RAM Pack or 128K EPROM Pack	£43.40
512K RAM Pack	£169
Z88 Spellmaster for Pipedream	£51
Z88 to BBC Link	£21.70
Z88 to PC Link II	£30
Z88 to Macintosh Link	£49
Z88 EPROM ERASER	£34.75
Serial Printer Cable	£8.65
Parallel Printer Cable	£24.00
Z88 Modem	£145
Z88 Soft Carrying Case	£8.50
Sinclair Z88 Computing Book	£9.95
AA Nicad Rechargeable Battery	£1.50
Battery Charger, Compact & Fast (3 Hours)	£6

Continued →

MONITORS



All Monitors are supplied complete with BBC connecting leads FREE.

MICROVITEC 14"

● 1431 – Standard resolution as used on the BBC television computer programme	£175
● 1451 – Medium resolution, suitable for word processing in mode 0	£219
● 1441 – High res, exceeds the capabilities of the BBC micro	£359
● 1431AP RGB + PAL and AUDIO	£199
● 1451AP RGB + PAL and AUDIO	£255
● **2030 CS 20" Med Res**	£380
● **2040 CS 20" Hi Res**	£675
● Dust Cover for Microvitecs	£5.50
● **Touchtec 501 Touch Screen**	**£239**

14" MULTISCAN COLOUR

● **TAXAN** Multisync 770 Plus	£449
● **EIZO** Flexscan 80605 – For technical info. read the review in Micro User, Jan. '89	£459

TAXAN 12"

● TAXAN Super Vision 2 **Type 620** Hi-res RGB Colour, Green/Colour Switch	£265
● TAXAN Super Vision 3 – **Type 625** Super Hi-res RGB Colour, Green/Colour Switch	£315

PHILLIPS

● BM7502 12" Hi-res Green Monitor	£65
● CM8833 14" Med. Res Colour Monitor	£219

STAR BUY

● **PHILLIPS 14"** Medium Res, dark glass, attractively finished Colour Monitor – supplied complete with RGB, SKART and Audio/Phono Inputs. A push-button switch toggles between Hi-Res monochrome green text mode and full colour display. (Please state the type of Connecting Lead you require).

ONLY £199

Dust Cover for Phillips Monitors	£6

SPARE LEADS

BNC Lead for Zenith or Philips	£3
Skart Monitor Lead	£5
RGB lead for TAXAN Monitors	£3
Archimedes Colour Monitor Lead	£7.50

SWIVEL BASES

By simply placing your monitor on one of our front adjustable professional swivel bases (see drawing at the top), you can easily adjust the monitor viewing angle.

for 12" Monitors **£8** (carr. £2.50)
for 14" Monitors **£12** (carr. £2.50)

Anti-Glare VDU Screen

These extremely effective, easy to install, 12" & 14" VDU screens eliminate harmful glare, improves contrast on colour monitors. Increases productivity in offices. A must for all wordprocessor users. **£12**

TAXAN KP-815 PRINTER

80 column, Bi-directional, 160 CPS, (NLQ 24cps); Friction & tractor feed + paper roll holder as standard; Epson FX compatible.

Offer Price £155

Taxan KP915 132 Column	**£275**
RS232 Interface	£49
RS232 Interface with 2K Buffer	£69
RS232 Interface with 16K Buffer	£89

Panasonic KX-P1081

Attractively finished in BBC beige. Bi-directional, logic seeking. Has IBM and Epson RX compatible command calls. Speed: 120CPS draft mode, 24 CPS NLQ mode. Character width range from 5 cpi to 17 cpi. Upto 40 downloadable characters. Functions include, Proportional spacing, Justification, centering and left & right ranging.
(Price inludes, FREE a 4ft Printer Lead, and a Dump Out 3, Screen Dump ROM worth £35 with every printer purchased from us).

SPRING SALE OFFER only: **£139**

Optional RS232 Interface:	£39

NEW

PANASONIC KX-P1124

Watford Electronics, your authorised Premier Panasonic Dealer, brings you from the prodigious Panasonic Stables, this fabulous 24-pin printer.

Available NOW at a superbly realistic price, KX-P1124 perfectly balances features, quality of construction and Value for Money to produce the printer of tomorrow, here today, ready to sweep the current generation of machines away.

Ingenious innovation in terms of software control codes permits great flexibility when it comes to defining the print style. A nippy 192 cps of clear draft speed backs up the crisp 60 cps Letter Quality text mode, with 6 fonts. A delightful range of assorted character width is efficiently supported, with sizes ranging from a broad 5 to petite 20 CPI, even in LQ mode. Some of the extensive support for serious use includes, justification, centering, left and right ranging and proportional spacing.

A full 96 ASCII character set is supported with an extended set of Italic, 32 International (13 countries) and 158 IBM special characters. A 6K Print Buffer alleviates much of the wait time normally associated with printing, whilst the bi-directional logic seeking (character & graphics), print head takes the quickest route to print as required.

Simple paper parking and easy front loading of A4 sheets add an extra dimension. Not only Epson LQ & IBM Proprinter emulation modes are implemented, but extra codes have been added to cater for LQ option.

At less than 53dB, this is perhaps the quietest dot matrix printer on the market.

Watford's Launch Offer: **£269**

PANASONIC PRINTERS

● **KX-P1180** 9pin 80col. 192/38 CPS	£169
● **KX-P1540** 24pin 80col. 240/80 CPS	£435
● **KX-P1592** 9pin 136col. 216/45 CPS	£275
● **KX-P1595** 9pin 136col. 288/61 CPS	£409
● **Panasonic KX-P4450** LASER PRINTER Latest technology at Watford's special offer price	£1,499

● Spare Toner **£29** ● A4 Feeder **£55**

INTEGREX COLOUR JET PRINTER

● Colour Jet 132 Printer	£515
● Paper Roll	£6
● Screen Dump Software	£10
● Colour Cartridge	£14
● Black Cartridge	£8
● 100 A4 OHP transparencies	£55
● 8K Serial Interface Optional	£123
NEW – Intergrex COLOURCEL NPQ Ink Jet Colour Printer	£2,695

NEC P2200 PINWRITER

24 pin; 80 column; 168CPS – 56CPS LQ; Epson LQ compatible, 7K Buffer; 7 resident FONTS, Friction & Tractor feed, front load single sheet feed, etc. **£269**

Pinwriter Serial Interface (optional)	£55
P2200 Cut Sheet Feeder	£65
Additional Font Cartridge	£25
NEC P2200 Pinwriter Ribbon	£6

NEC PINWRITER P6/P7 Plus

The Ultimate 24pin matrix Printer for Business.

NEC P6+ 80 columns	£439	**NEC P7**+ 136 columns	£575
Colour Option	£74	Serial Interface	£73
Cut Sheet Feeder	£125		

Star LC10	**£175**	**LC10 Colour**	**£215**
Star LC24-10	**£279**	**NB24-10**	**£399**

Brother HR20 DaisyWheel Printer	**£339**

EPSON PRINTERS

EX800	£405	LQ850	£430
EX1000	£564	LQ1050	£570
FX850	£315	LQ2550	£925
FX1000	£425	LQ2500+	£839
FX1050	£439	LX800	£175
LQ500	£275	SQ2500	£975
GQ3500 Laser	£1150		

PLOTTERS

Hitachi 672 Colour Plotter	£475
Plotmate Plotter A4S	£379
Plotmate Plotter A3M	£549

CUT SHEET FEEDERS for

EX800 **£149**; EX1000/LQ2550 **£210**; FX800 **£149**; FX1000 **£179**; LQ/LX800 **£139**; LQ500 **£75**; LQ850 **£135**; LQ1050 **£175**.

TRACTOR FEED for

EX800/1000 **£85**; LQ800 **£44**; LQ850 **£69**; LQ1050 **£85**; LQ2500 **£195**

ACCESSORIES

● EX800/1000 Colour Option	£55
● EX800/1000 Colour Ribbon	£18
● LQ2500 Colour Option	£65

(Securicor Carriage on Printers £7

EPSON PRINTER INTERFACES

All these interfaces fit inside the printer.

RS232	£32	RS232 + 2K Buffer	£52
IEEE 488	£40	RS232 + 8K Buffer	£79

PRINTER LEADS

BBC Centronics 4' long	£5
BBC Centronics 6' extra long	£7
Compact's Special Centronics Lead	£7
Archimedes Printer Lead 1 meter	£6
Nimbus Centronics Lead	£12
IBM Parallel Lead 1 meter	£6
Double Ended 36 way Centronic Lead 4'	£7
Double Ended 36 way Centronics Lead 6'	£9
MSX Centronics Parallel Lead 4'	£12
RS232 Leads (Various)	P.O.A.

RS-232 GENDER CHANGERS

Male to Female	£4.95
Male to Male	£4.95
Female to Female	£4.95

Listing Paper (Perforated)

● 1,000 Sheets 9½" × 11" Fanfold Paper	£7
● 2,000 Sheets 9½" × 11" Fanfold Paper	£12
● 1000 Sheets 9½" x 11" NCR 2 Part Fanfold	£19
● 1,000 Sheets 15" × 11" Fanfold Paper	£9
● 1000 Sheets true A4 Fanfold Paper	£11
● 2000 Sheets true A4 Fanfold Paper	£19
● Teleprinter Roll (Econo paper)	£4

(All our Fanfold paper is Micro perforated leaving a smooth clean edge when the tractor feed strips are detached).

Carriage 1K Sheets £2.50. 2K Sheets £3.00

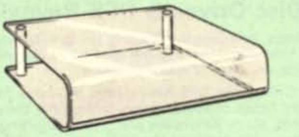
PRINTER LABELS

(On continuous fanfold backing sheet)

1,000 90 × 36mm (Single Row)	£5.00
1,000 90 × 36mm (Twin Row)	£4.90
1,000 90 × 49mm (Twin Row)	£7.50
1,000 102 × 36mm (Twin Row)	£6.25

Carriage on 1,000 Labels £1.00

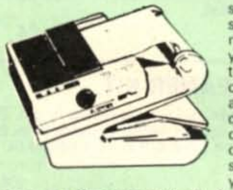
Perspex Printer Stand



Give your Computer System a touch of Class with our elegant, smoke finished Perspex Printer stand. The printer sits on top and the fanfold paper rests neatly underneath, thus occupying the same space as the printer footprint.

Only: £16 (carr. £3)

Professional Printer Stand



This new professional printer stand takes hardly more space than your printer. Due to the positioning of the paper feed and re-fold compartments ie. one above the other, the desk space required for your printer functions is effectively halved. Additional facilities include: Easy access to paper from both sides, used with both top and bottom feed paper and with its dial controlled paper feed system with adjustable deflector plates it ensures smooth paper flow and automatic refolding.

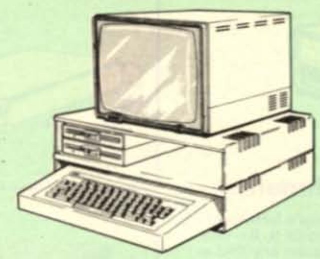
***80 Column version £23** (carr. £3)*
***132 Column version £26** (carr. £3)*

PRINTER RIBBONS & VARIOUS DUST COVERS

Type	Ribbons	Dust Covers
BBC Micro	–	£3.50
BBC Master	–	£4.00
Archimedes Micro pair	–	£9.00
IBM PCs pair	–	£6.00
Brother HR15/20	£3.00	£5.00
DMP2000	£3.75	£4.75
EX/LQ800	£4.50	£4.50
EX/LQ1000	£7.50	£5.00
RX/FX80/85/800/MX80	£3.90	£4.95
RX/FX100/1000	£5.75	–
Kaga/Taxan KP810/815	£4.90	£4.00
LC10 (Black)	£4.25	£5.00
LQ500/800	£3.75	£5.00
LQ1050/LQ2500	£8.50	£5.50
LX80/86/800	£3.80	£4.50
M1009/GLP	£3.80	£3.75
Panasonic KX1080/81	£4.00	£4.75
SQ2500	£23.00	£5.50
Star NL10	£3.75	£4.50
Olivetti Ink Jet Cartridges (set of 4)	£9	

Our attractive Dust Covers are manufactured from translucent PVC. The seams are stitched and edges are taped to prevent splitting due to continuous use.

PLINTHS FOR BBC MICRO, MASTER & PRINTERS



Protect your computer from the heat of your VDU. Our micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and VDU, whilst the double height version provides enough room for our stacked disc drive and other peripherals like, Eprom programmer, music unit or simply discs & stationary. The computer slides neatly in the lower section allowing easy access to remove the lid.

The single printer stand is equally sturdy but instead of cooling slots it has elegant cutouts on the sides. This allows easy access to paper from all sides. Colour: BBC Beige.

Single BBC Plinth	**£12** (carr. £2)
Double BBc Plinth	**£20** (carr. £3)
Printer Plinth	**£12** (carr. £2)
Single Master Plinth	**£13** (carr £2)
Double Master Plinth	**£24** (carr £3)

Universal Printer Sharers/Changers

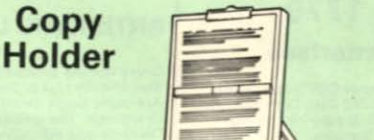
Connect upto 5 Micros to 1 printer or 5 Printers to 1 Micro with our combined, Sharer/Changer. These Units are made to a very high standard. For extreme reliability, they all have Printed Circuit Boards mounted inside the case, (not a Spagetti Junction of wires). Internal connection is made via high quality ribbon cables.

(Ideal for School environments.)

Connects	Serial	Centronics
2 to 1	£20	£22
3 to 1	£27	£30
5 to 1	£36	£39

(Cables extra at £5 each. Please specify type required when ordering)

Copy Holder



Whether you want to type in your latest program or the draft of a new trilogy, Watford's manuscript holders are superb for holding your paper at the ideal height and angle to allow you to read and type in ease and comfort.

Available in 2 full A4 versions, desk resting and shelf clamping. Paper is held firmly by means of a plastic retaining ruler and a clip grip. (for resting books or magazines, the desk top version is recommended).

Desk Top **£10** (carr. £3)
Angle poise **£14** (carr. £3)

MEGABUFFER 256

The Smallest 256K Printer Buffer Unit in the world **38mm x 130mm x 134mm**.

This new Megabuffer 256 from Watford is a full featured 256K Printer Buffer. It allows the computer to print 256,000 character in a short time thus freeing the computer very quickly. In short it makes light work of printing large documents, screen dumps, etc. It is extremely simple to connect. The features are:

- Improves efficiency by making more efficient use of computer and printer.
- Compatible with any computer and printer that uses Centronics Parallel connections including all BBCs, IBM PCs, etc.
- Total compatibility with all software.
- Cheaper phone bills when using your Modems.
- Ideal for those doing large graphics screen dumps that are slow to print.
- Multi-Copy facility allows you to print several copies via Megabuffer without going through your computer.
- Data Dump facility is included.
- Built in test unit for both the buffer & your printer.

In conclusion it can safely be said that MEGABUFFER 256 is the ultimate printer Buffer for both the amateur and professional user.

Only £149 (carr £5)

OKIMATE COLOUR PRINTER

The first ribbon transfer printer in its price range which offers fully versatile colour or black printing. A 24 element print head produces more than 100 shades with exceptional clarity. Ideal for use with Quest Paint or AMX Super Art.

Only: **£119**

BBC Screen Dump	£10
Colour Ribbon	£6
Black Ribbon	£6

THE EPSON RX-FX-KAGA PRINTER COMMANDS REVEALED

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX-KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English, how to use and make the most of your KP810, PW1080A or any other Epson FX80 compatible Printers like Panasonic KX-P1080/1, etc., with the BBC Micro, both from BASIC and Wordwise.

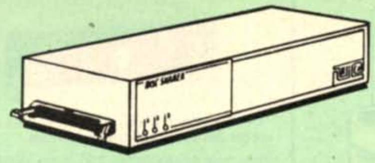
It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

£5.95 (No VAT)

CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234 or 33383

Continued →

DISC DRIVE SHARER



(Ideal for educational establishments)

At last, a low cost alternative to the Econet system. Watford's Intelligent Disc Drive Sharer allows you to connect 3 BBC micros (model B, B+ and Master series) to a single or double disc drive. Running under any DFS or DDFS, this intelligent unit will automatically queue the computers. Each computer has a status light dedicated to it. If it is green you will get immediate access to the disk, and red means that you are next in line. The unit plugs directly into the disc drive socket on each computer and is powered by the mains. (N.B. Not for use with ADFS.)

Launch Price: **£65** Price includes 3 Cables

NOW WITH EXTRA FEATURES AT NO EXTRA COST – Watford's latest DFS 1.44

- Incorporates Acorn's Official Tube Host Code so that those with 2nd processors no longer need to waste a ROM socket on the DNFS.
- Option to DOUBLE the speed of BPUT and BGET.

WATFORD's & ACORN's DFSs

Watford's popular and widely acclaimed DFS has now been available for six years and has gained a large following amongst serious and educational users of the BBC Micro. Owners of Acorn or any other standard DFS can upgrade to our "Ultimate" DFS merely by replacing their DFS ROM. See below for this upgrade. ***(P.S. Watford's highly sophisticated DFS is fully compatible with Acorn standard DFS). (while Acorn's 1770 DFS is fully compatible with Watford's Mk II DDFS)***

- *Watford's sophisticated DFS ROM only* **£16**
- *We will exchange your existing DFS ROM for Watford's Ultimate DFS ROM for only* **£12**
- *DNFS ROM only* **£17**
- *ADFS ROM only* **£25**
- *DFS Manual (Comprehensive)* *(no VAT)* **£6.95**

(P.S. Our DFS manual is the only comprehensive Manual available for the BBC micro and covers both Acorn & Watford DFSs).

(The Single Density DFS system is now old technology. Like Acorn, Watford too have decided to replace it with their more up-to-date 1770 DDFS interface. We have informed most of the software houses of this decision in order that they can ensure compatibility with our highly sophisticated and fully Acorn compatible DDFS).

NEW

Watford's MkII 1770

Double Density DFS Interface

Many of our customers have wanted to use our superior DDFS and Acorn ADFS together. Now our Mk II DDFS Board with its 1770 Disc Controller, has been adapted to allow the use of Acorn ADFS as well. It also has all the commands of the Acorn's 1770 DFS, plus the added features:

Added features include:

- Acorn ADFS compatible – Use ADFS on our DDFS board.
- Tube host Code – No longer any need to have the DNFS in your machine to use Co-Processors, even the CoPro and Master 512.
- Auto 40-80 Track sensing – no need to fuss with 40/80 track switches (even works with protected disks).
- An extremely powerful 8271 emulation – ensuring compatibility with almost all software.
- New low profile – small footprint board.
- Fits with all third party ROM boards.
- Option to double the speed of file handling operations – BPUT and BGET.
- Operates in both single and double density modes.
- OSGBPB has been recoded, increasing still further the speed of file handling.

Please note that not all DDFS's are capable of providing either the full 80% storage increase or of allowing a file the full size of the disk – Ours allows both of these!

If you already have a DDFS (any manufacturer), and wish to upgrade to our MkII version, then simply return your existing ROM and DDFS board and we will supply the new DDFS for only **£30.00**.

- Special introductory offer **£39.00**
- DDFS Manual (No VAT) **£6.95**
  - We will exchange your existing DFS Kit for our sophisticated DDFS for only **£25.00**

Please note, as the MkII DDFS is a hardware and software upgrade, it is not possible for existing Watford DDFS users to simply exchange their ROM for the new version.

DUST COVERS (For our Disc Drives)

Single CLS (without PSU) **£3.20** Twin CLD (without PSU) **£3.85**
Single CS (with PSU) **£3.95** Twin CD (with PSU) **£3.90**

Special 40/80 Disc Drive/DDFS Mk II Offer

- The popular 40/80 track 400K single Disc Drive, Double Sided, cased with Cables. Plugs directly to your Micro.
- Watford's extremely popular DDFS Disc Interface (allows 720K storage). Will run in both, Single & Double Density modes.
- A comprehensive User Friendly Manual.

A Bargain at Only **£123** (£7 carr)
(Offer valid while stocks last)

3½" DISC DRIVE OFFER

These top quality 3½" Double sided, 80 track, 1 Megabyte (unformatted each Disc Drives), are attractively finished in BBC beige. They are supplied complete with all cables and a Utilities Disc. They run directly from the BBC B/Master's own PSU.

- **CLS35 400K Unit** **£69**
- **CLD35 800K Unit** **£126**

Mysteries of Disc Drives & DFS Revealed

Are you tired of faulty cassettes, and lengthy loading times? Do you want to upgrade your BBC micro to take discs but you get tied up in the plethora of jargon surrounding the choice and use of these systems.

Then The Mysteries of Disc Drives and DFS Revealed is the book for you. It explains in detail the different types of systems available, how they are installed and how to use them. Many examples are given including pre-written programs to call various functions of the DFS available only through Operating System calls. Different types of disc, 40/80 tracks etc. are all explained. This book is ideal for the beginner confused by the plethora of choice available in the marketplace.

£5.95 (Book No VAT)

DISC ALBUMS

Attractively finished in black leather look vinyl. Stores upto 20 Discs. Each disc can be seen through the clear view pocket.

£4

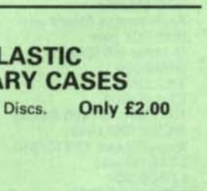
FLOPPY HEAD CLEANER KIT

The heads in floppy drives are precision made and very sensitive to dirt. The use of a cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. It is very simple to use. Available in 3½" & 5¼", please specify.

£4

ANTISTATIC LOCKABLE DISC STORAGE UNITS

Gives double protection – Strong plastic case that affords real protection to your discs. Antistatic helps avoid data corruption whilst in storage. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.



- **M35** - holds upto 50 5¼" discs **£4.95**
- **M85** – holds upto 95 5¼" discs **£6.95**
- **M25*** – holds upto 25 3½" Discs **£4.95**
- **M50** – holds 50 3½" Discs **£6.50**
- **M10** – holds upto 10 Data Cartridges **£15**

* Not lockable

PLASTIC LIBRARY CASES

Holds up to 10 5¼" Discs. **Only £2.00**

DISC PLONKER RACK

When using ones micro, there is a tendancy to have more than one Disc on the desk. This exposes them to the hazards of fingerprints, scratches, dust, coffee and an untidy desk.

Why not protect your valuable data from all these hazards with the help of our extremely handy and low cost DISC PLONKER RACK. It holds up to eight 5¼" Discs.

Protection at Only: **£2**

Quality Disc Drives from Watford

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.

The first capacity given in the first column indicates capacity in single density mode. That within the brackets is the capacity in double density mode. All disc drive type numbers start with the prefix "C".

The tinting on some of the boxes is used to indicate which Drives are 40 track (non-tinted) and which are 80 track (tinted). All our 80 track drives are already fitted with a 40-80 select switch.

***All our Disc Drives are Double Sided and will operate in both Single and Double Density modes.** Extensive experience of the usage of disc drives suggests that the JAPANESE drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.*

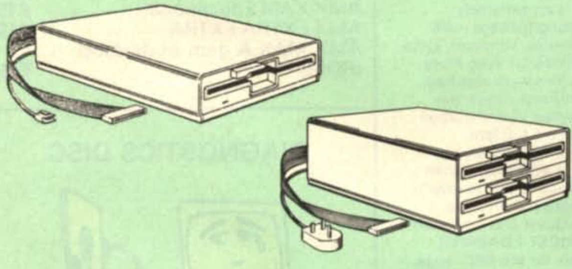
Various UK "manufacturers" of disc drives for the BBC micro (more accurately, "packages" label other manufacturers drives with their own name). We buy the high quality NEC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.

Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate (extensive tests within our workshops have confirmed this). All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. Ideal for Schools & Colleges. We are now able to supply all single disc drives with Power Supply, in either single or dual case. (Dual case has a twin data cable and a power supply capable of driving two disc drives) allows easy expansion to a dual drive unit, at a later date. Prices stated in the pricing boxes below are for single drives in standard single cases. Single drives in a dual case cost an extra £10. (At Watford we anticipate your needs of tomorrow, not just today)!

When using a BBC Micro, most people find themselves short of desk space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space) your BBC, Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with Watford plinth. (Turn to the 5th page of our advert for the Plinths).
P.S. All our 5¼" Disc Drives with PSU are compatible with the Compact Micro. All you require is the special Compact Disc Drive Cables designed by us.

Our Disc Drives conform to BS415



"Test Bureau Approved for Use in Education"

Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
400K (720K)	CLS400S £79	CLD 400 £168	CS 400S £89	CD400 £188
800K (1.44M)		CLD 800S £159		CD 800S £169

- TWIN Disc Drive Case, complete with Power Supply & Cables **£43**

Securicor carriage on Disc Drives £5 to £6

Prefix ***C*** *= Cased Drive*
L *= Less PSU*
S *= Single*
D *= Double*

Suffix ***S*** *= 40-80 Switchable*

e.g. CLS400S = Cased Disc Drive, Less power supply unit, single 5¼" 400K, (720K in double density); Double sided; 40/80 track switchable.

Cable to connect 5¼" Disc Drives to BBC Compact
Single £9 Twin £12
Special Cable to connect both 3½" and 5¼" Disc Drives simultaneously to the BBC Compact £13

3M – DISKETTES

3M – SCOTCH Diskettes with Lifetime warranty from Watford Electronics your 3M Appointed Distributor.

● *10 × 5.25" S/S D/D 40 Track Diskettes (744)*	***£6.00***
● *10 × 5.25" D/S D/D 40 Track Diskettes (745)*	***£7.00***
● *10 × 5.25" S/S D/D 80 Track Diskettes (746)*	***£11.50***
● *10 × 5.25" D/S D/D 80 Track Diskettes (747)*	***£11.00***
● *10 × 5.25" 1.6M D/S D/D High Density Discs for IBM XT and AT*	***£16***
● *10 × 3.5" S/S D/D 40/80 track Discs*	***£10.00***
● *10 × 3.5" D/S D/D 40/80 track Discs*	***£11.75***
● *10 × 3.5" High Density Diskettes*	***£25***

TOP QUALITY 3½" & 5¼" DISKETTES

To complement our range of Quality Discs and Disc Drives, WE are now supplying SPECIAL OFFER packs of 10 Lifetime guaranteed discs. Each disc has a reinforced hub ring. Supplied complete with selfstick labels and a Plastic Library Disc Box.

● *10 ×* ***M3*** *3.5" D/S D/D 80 Track Discs*	***£11***
● *10 ×* ***M9*** *3.5" Double Side High Density*	***£25***
● *10 ×* ***M4*** *5.25" S/S D/D 40 Track Discs*	***£5***
● *10 ×* ***M5*** *5.25" D/S D/D 40 Track Discs*	***£7***
● *10 ×* ***M7*** *5.25" D/S D/D 80 Track Discs*	***£9***
● *10 ×* ***M8*** *5.25" D/S H/D Hi-Density Discs*	***£14***
● *3" Double Sided Discs*	***£2.50*** *each*

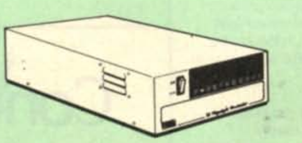
PRICES SLASHED

Special BULK OFFER on 5¼" DISCS

(Supplied packed in Anti-Static Lockable Storage Units)
(Lifetime warranty on Discs)

BULK PACK DISCS in lots of 100

Type	S-S 40T	D-S 40T	D-S 80T
● Without Sleeves	£35	£39	£45
● With Sleeves	£38	£42	£48



WATFORD's WINCHESTER DRIVES

Undoubtedly the best value for money Winchester Hard disc available anywhere for the BBC Micro.

This 30 Megabyte hard disc is completely compatible with the Acorn ADFS – that's why we have bundled it with each Winchester drive, along with a Utilities Disc.

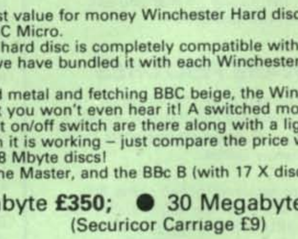
Finished in rugged metal and fetching BBC beige, the Winchester has an internal fan, so quiet you won't even hear it! A switched mode power supply and a neon-lit on/off switch are there along with a light on the hard disc to tell you when it is working – just compare the price with our competitors' 20 or 28 Mbyte discs!

Compatible with the Master, and the BBc B (with 17 X disc interface).

● 10 Megabyte **£350;** ● 30 Megabyte **£405**

(Securicor Carriage £9)

CDP800S



CDPM800S

Twin 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC Micro. Supplied complete with integral power supply, cables and Utilities disc. The mains switch with neon On/Off light indicator, and the two 40/80 track switches are mounted on the front panel for ease of use.

CDP 800S for BBC Micro £182
CDPM 800S for Master £183
DP35-800 for BBC/Master £169
(For DP35-800S spec. see Page 12 of our advert)

(Securicor Carr. £7)

(The above drive units are 2 Megabytes unformatted)

Continued →

QUEST
MOUSE Mk II

QUEST MOUSE MkII

The ultimate in Mouse technology, the Watford Electronics Quest Mouse must be the most powerful Mouse package yet produced for the BBC Micro. Featuring state of the art 32K ROM software the Quest Mouse package is filled with features essential to the budding artist. The Quest Mouse is a high precision, low profile and large footprint mouse. It has three large comfortable buttons and its RUBBER COATED STEEL BALL is smooth and easy to use on virtually any work surface. This also eliminates any directional bias that one encounters on the most well-known mouse for the BBC. The Quest Mouse is FULLY HARDWARE COMPATIBLE with the AMX MOUSE so that it will work with any of the AMX range of software.

The two parts of the Quest package are available separately so that existing Mouse owners can upgrade to the Watford's sophisticated Quest Paint software or replace their existing worn out mice for a minimum cost.

QUEST PAINT

The Quest Mouse software is supplied on a PALPROM unit to allow the sophisticated 32K program to be used from a single ROM socket. It is compatible with the BBC B, BBC B Plus and BBC Master Series machines.

The software is used to draw high resolution Mode 1 pictures in full colour. All menu selection and control of the drawing process is performed with the mouse so that you will hardly ever touch the keyboard.

SOFTWARE FEATURES

The software is far too powerful for us to describe it fully in such a small space. Below is a list of the various features. Please write to us for a fully descriptive leaflet.

Disk interface not required. Utilities disk has facility to create and print big screens. Colours applied can be solid, either pattern of user defined pattern. Drawing can use brush or airbrush. Brush shapes can be defined and stored. Airbrush sprays colour/pattern randomly with four jet sizes and even or center spread. Colour cycles. Colour protection to stop particular colours from being overwritten by selected drawing actions. All standard drawing facilities like: rubber, straight pencil lines, triangles, circles, ellipses, rectangles, parallelograms, polygons, etc are provided. All shapes can be solid or just a boundary line. Once a shape has been set up it can be repeated anywhere on the screen. Global colour replace in a rectangle. Powerful fill facility for areas and vertical/horizontal lines. Full cut and paste of rectangular areas with rotation and size with screens from Watford Beeb Video digitiser. Load and Save screens with colour pallet information, save brush and pattern definitions etc.

Take The Guesswork Out of Selecting a Mouse Package
With reviews like this how can you go wrong.

A&B Computing June '87

"... you will have one of the most comfortable and professionally built mice I have used in a long time. The buttons are responsive, the mouse movement is smooth and without directional bias – a pleasure to use."

"What we have here is probably the best art package there is for the BBC Micro ..."

"Quest Paint is a major leap forward in BBC programming..."

"Quest Paint is an original piece of programming, it is friendly and well endowed with many useful facilities. I would comfortably say it is easier to draw good pictures with Quest Paint than it is with more expensive 'Professional' art packages for the Atari ST and the Commodore Amiga. A recommended buy if you are looking for the best in BBC micro based art packages".

Acorn User, September '87

"... this package represents excellent value for money. If you are interested in art then this program is for you to buy".

"All in all, Quest Paint is a very professional package. It contains virtually every feature the budding artist could require".

Quest Mouse II & Quest Paint	**£58**
Quest Mouse II, Quest Paint, AMX Stop Press & Pagefont	**£89**
Quest Mouse II only	**£26**
Quest Paint Software only	**£34**
Quest Font Disc	**£15**
Quest Mouse Mat (Red or Blue please specify)	**£3**
Part Exchange your unreliable AMX Mouse for a Quest Mouse for only	**£22**
GXR ROM for the BBC Micro	**£22**

(P.S. Quest Paint is not compatible with BBC Compact)

N.B.

1. Quest Paint supplied complete with Software in a 32K ROM, Comprehensive User Guide and a Utility Disc.
2. Quest Font Disc has 22 text FONTS for use within Quest Mouse.

ConQuest

Watford's Quest package is an extremely powerful and flexible drawing package, with very wide and unusual features. However, since its launch various suggestions for even more advanced & powerful facilities were received from the Quest users. ConQuest allows you these more advanced facilities, like, distortion of a cutout to any shape and a full font designer. If you also have a GXR ROM in your machine or you are using a BBC Master then ConQuest will take advantage of this to give ellipses at any angle, sectors and arcs, etc. Quest combined with ConQuest and Acornsoft GXR ROM make up THE MOST POWERFUL drawing packages available for the BBC range. Quest Paint is able to take advantage of almost any additions to your machine, such as Shadow or Sideways RAM. ConQuest takes this principal even further, by utilising the otherwise normally incompatible Sideways RAM facility by holding pictures in them.

Some of the features are:

- *Pick filenames off the screen for loading and saving.*
- *Rotate a cutout to any angle and Distort it to any four sided shape.*
- *Has Built in Font editor.*
- *Default brushes and patterns on startup.*
- *16 x 16 font available on start up.*
- *Ability to reset patterns, fonts and brushes to default at any time.*
- *ROM based enhanced Epson and compatible printer dump.*
- *ROM based enhanced extended picture routine.*
- *Ability to create and abort extended pictures.*
- *Improved disk access speed for extended pictures.*
- *User definable sideways RAM driver for incompatible sideways RAM systems.*
- *Ellipses at any angle on Master 128 (or B with GXR ROM).*

ConQuest ROM Package **£30**
(Price includes software in ROM and a comprehensive Manual).
(Not Compatible with BBC Compact)

RB2 Marconi
TRACKER BALL

RB2 (AMX/Quest compatible)	**£45**
RB2 including Quest Paint	**£75**

FLEET STREET EDITOR

Software pack for BBC Micro	**£33**
Software pack for the Master	**£39**
Software Pack for Compact	**£40**
Admin Xtra Disc Utility	**£13**
Walt Disney Disc Utility	**£13**
Fonts N Graphics Disc Utility	**£13**

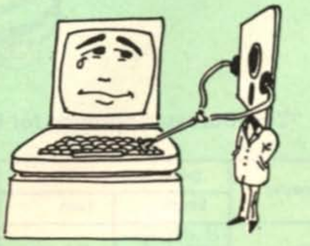
THE NEW Mk III AMX MOUSE

ONLY: £59 Inc. Super Art package
(carr £3)
(Please specify for BBC, Master or Compact)

FREE our popular Colour Art software pack worth £15 with every AMX Mouse package purchased from us.

MOUSE MAT	**£3**
AMX MOUSE ONLY	**£29**
AMX UTILITY Package	**£11**
AMX SUPERART Package	**£34**
AMX STOP PRESS – A Desktop publising software. Works with Keyboard, Joystick or a mouse	**£32**
PAGE-FONTS – Over 20 Fonts for use with AMX Pagemaker	**£12**
AMX DESIGN (ROM)	**£55**
AMX XAM Educational	**£15**
AMX EXTRA EXTRA	**£16**
AMX MAX A gem of desktop (ROM)	**£15**

DIAGNOSTICS DISC



The BBC Micro is a very complex machine and thus diagnosing a fault can be very difficult. At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.

The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:

RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.

This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Only £20.00

BEEB VIDEO DIGITISER

"Test Bureau Approved for Use in Education"

Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro.

This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket.

Images produced can be compressed, stored to disc, printed on an Epson compatible printer, directly used to generate graphics, analysed for scientific and educational use or converted to other formats e.g. Slow Scan TV or receiving a picture from a remote camera using a modem.

The output from the digitiser exactly matches the graphics capability in each mode, with up to 8 levels of grey in mode 2. The unit connects into the User Port and automatically scans a complete picture in 1.6 seconds.

Both the black and white levels can be adjusted manually for the optimum picture, or switched to automatic for unattended use. The image produced can be reversed if necessary.

Full controlling software is supplied on a normal sideways ROM and this is easily accessed via additional * commands. The package i designed to allow easy input of complex screens and give full access of the data to the user. Once on the screen, the image can be used as a normal graphics screen, allowing any of the usual graphics commands in BASIC or other ROMs to work on it.

A special print dump routine is included with the driver programs. This is specially designed to produce a fast, correctly proportioned picture, with reduced "contouring", resulting in an accurate reproduction of the original image.

Detailed examples of driving this unit from BASIC or other languages are all provided in the extensive manual supplied.

£109 (Carr. £5)

(Price includes) Digitiser Unit, Software in ROM & a Comprehensive Manual)
(BBC B+ and Master compatible, except Master with Econet)

Magazine Maker

(As seen on TV)

A combination of the Pagemaker and Watford's Beeb Video Digitiser.

Using any video that provides a composite signal and the digitiser, images from a camera or TV can be converted into a graphics screen on the BBC Micro.

They can then be used within Stop Press to illustrate magazines or newsletters – in fact anything that needs to be created on A4 size paper.

With Stop Press's many features, a variety of pictures can be composed – the only limit being the imagination.

Pictures can be doctored using Stop Press's graphics option to produce any number of effects.

Text can be formatted around the digitised photo on screen using the facilities available, which include 16 typefaces, character and pattern definer, text formatting and the ability to load in wordwise and viewfiles plus much more.

Once created the picture can be printed out.

The Magazine Maker is suitable for any use that requires illustrated documents.

Complete Package **£135.00** (carr. £3)

WAPPING EDITOR
"MIGHTIER THAN THE QUILL"

Watford Electronics bring professional quality Desktop Publishing to the Beeb. The Wapping Editor is a totally self contained mouse-driven desktop publishing package designed to run on the BBC B, B+ and Master computers. The massive 64K Rom contains ALL the software you need to do your own publishing. It 'Brings the Freedom of Press' to your fingertip. The software has a word processor, a graphics package, a page layout section and a font designer. Although very sophisticated, Wapping Editor is simplicity itself to use. Anyone already familiar with Quest Paint will immediately feel at home.

GRAPHICS PACKAGE

Imagine Quest Paint re-written to take advantage of the high resolution of Mode 0, well this is it. The Wapping Editor could well be worth buying for this facility alone. This must surely be the graphics.

WORD PROCESSOR

This section is a fully functional word processor specially tailored to suit the Desktop Publishing environment. Gone are all the unnecessary and cumbersome text formatting commands – these are dealt with in the 'Page-Layout' section. The features of this word processor include wordwrap, wordcount, insert/overwrite, move block, copy block, delete block, search and replace, browse, etc, many of these features being mouse controlled. Text input can of course be taken from existing word processor files like Wordwise, View, etc, but it is not necessary to have a separate word processor in order to use this package.

PAGE-LAYOUT SECTION

Page Layout becomes easy using these mouse-driven routines. The user simply 'pulls' a rectangle onto the page and states which text document or graphic is required to fill the space – it's as simple as that! Text can be automatically printed in a pre-set number of columns, left justified and/or right justified, or centered. Several different typefaces can be held in memory at one time. Graphics may be stretched, squahsed or cropped to fit any size rectangle. Graphics input can be from the software provided in the package or, using the 'mode convert', from any graphics mode screen.

THE FONT EDITOR

This is an enhanced version of the font editor contained in the Con-Quest ROM and allows the editing of ALL 95 characters. As well as being able to design your own typefaces, fonts from other DTP packages or from Quest Pain may be loaded into the editor and converted for use with the Wapping Editor. This sophisticated editor has numerous functions including slide, flip, invert and rotate individual characters or the whole font. Individual characters can be mirrored or copied and a mask feature allows you to superimpose two characters. Lines and columns can be inserted or deleted allowing the character to be stretched or squashed. This font editor will also allow 'font' and 'brush' files to be designed for use with Quest Paint.
This package is the latest in the line of integrated professional quality mouse-driven software from Watford Electronics, the company that adds power to Beeb.

Wapping Editor	Launch Offer: **£69**
Wapping Editor with Quest Mouse	**£89**

MARK II LIGHT PEN

Our Mark II Light Pen is the very latest in light pen technology. It is totally insensitive to local lighting conditions and works with many different monitors. The pen only responds to the High Frequency light produced by your monitor/TV. An LED indicates when valid video data is being produced. A conveniently located switch is also fitted.

Price Only £21

DUMPOUT 3

A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including full Mode 7 graphics.
Also provided are window setting utilities and OSWORD calls to plot and read Mode 7 graphics pixels.

Facilities:

- Vertical and horizontal scaling in all graphics modes and mode 7
- Rotation of image by 90, 180 or 270 degrees
- Left hand margin setting
- Screen dump window setting
- Colours appear as grey scale
- Two tone fast dump
- Colour mask
- Mode 7 contrast expansion
- Mode 7 contiguous dump
- Key triggered and User Port triggered dumps

The Micro User Feb. 1985.
'Without reservation I wholeheartedly recommend the Dump Out 3 ROM as the ultimate screen dump facility for the BBC Micro . . . it must represent excellent value for money and surely cannot be beaten".

For use with the following printers:
GLP, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, M1009, NEC PC8023, DMP100/200/400, Panasonic KX1081/82, Mannesman Tally and compatibles.

Only: £25

CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234 or 33383

Continued →

ARIES CORNER

B-32 Shadow RAM Card

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Comal, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus, Interword and many other applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved *FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as the printer buffer) or to load tape programs into a disc system.

The B32 simply plugs into the 6502 processor socket on your BBC micro – no flying leads to connect and no soldering. Provision of the on-board ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

- Recommended by Computer Concepts for use with their Inter series of ROMs.

Price: **£80** (carr. £2)

Aries B-12 Sideways ROM Board

This board is extremely well made, simple to install, reliable when fully loaded and compatible with the Aries-B20 and the Aries-B32

The B12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on the board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

The B12 system consists of two parts: a large detachable "mother board" which carries the extension ROM sockets and a small "base board" on a short ribbon cable, which plugs into the existing sideways ROM sockets. This two-board design eliminates the reliability problems previously associated with some other ribbon-cable based systems.

If you do not have a B32 or B20, a small adaptor module (the Aries-B12C) is available at a nominal cost.

Price:		
	Aries B-12	**£40**
	Aries B-12C	**£5**

CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234 or 33383

ARIES B-488 IEEE-488 INTERFACE UNIT

The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB' or 'HP-IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

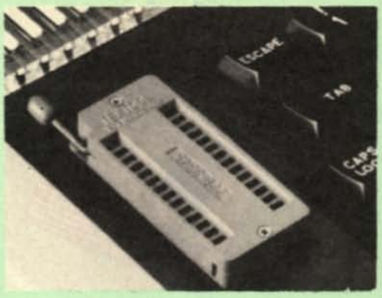
£238 (Carr £3)

EXTERNAL ROM BOARD for BBC MASTER

This external Beige finished, free standing cased unit with its own Power Supply allows you to plug-in upto 12 ROMs and 16K Sideways RAM.

Only £78

SIDEWAYS ZIF SOCKET



Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

- Very simple to install. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.
- The low profile of the socket allows unrestricted access to the Keyboard.
- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.
- This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for all professionals and Hobbyists alike.)
- BBC, B+ and Master compatible.

ONLY **£18** (carr £3)

Low Profile CARTRIDGE SYSTEM

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack for the BBC B.

● Complete System	**£11**
● Spare Cartridges	**£2.50**
● Spare Rack	**£1.50**

ROM Cartridges for the BBC Master
Twin **£8**; Quad **£12**

16K DISC RAM

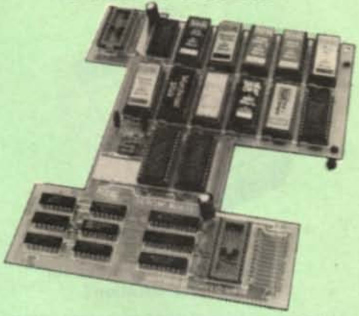
Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.
Key points to note about this new addition to the Watford range of products are:

- Write protection (useful in a variety of circumstances).
- Compact construction.
- Supplied complete with Battery Backup.
- No overheating or overloading problems.
- Free utilities disc supplied.
- Can be used as a 16K PRINTER BUFFER.
- Ideal for professional software development.
- Supplied with utilities software disc.

Only: **£35** (carr £2)

P.S. 16K Disc Ram Board is not designed to work in conjunction with a Sideways ROM Board.

SOLDERLESS SIDEWAYS ROM SOCKET BOARD



In the May 1986 Micro User's independent review, the writer concludes, "The board has been well laid out. Its position is much better than others – not over the HOT RAM chips and further away from the disc controller area". "I give the solderless ROM board the thumbs up and wish it success".

This brand new board from Watford Electronics is designed specifically for those wishing to add a ROM board to their own BBC without the need to perform any soldering.

This new board expands the total possible number of ROMs in a BBC from 4 to 16.

Unlike our competitors inferior boards, the ONLY upgrade required for fitting battery backup to the Watford Solderless ROM board (all Watford ROM boards, actually) is the fitting of the battery itself. (No other expensive components are required.)

- The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:
- Increase your BBCs capacity for ROMs from 4 to 16.
- **No soldering required.**
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 takes two 6264 RAM chips.
- Read protect to make RAM "Vanish") allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £35
Battery backup fitted **£39**
Battery Backup only **£3**
(carriage £2)

- Sideways RAM Utilities Disc for Solderless ROM Board. Includes the options to load and save ROM Images and the facility to use Sideways RAM as Printer Buffer.

Only: £8

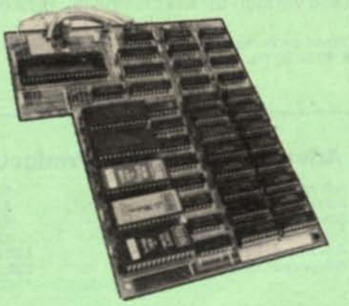
USER PORT SPLITTER UNIT

User Port Splitter
A
B

Gone are the days when you had to plug and unplug devices from the User Port. This extremely useful little device allows two units to be connected to the User Port simultaniously, and select between them simply by toggling a switch. This device is particularly useful for those people using Quest Mouse and the Watford Video Digitiser or any similar combination.

Excellent Value at **£22** (carr £2)

ROM/RAM CARD



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 3 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO overheating problems.
- No User Port corruption (avoids problems with the mouse, modems, Eprom Programmers, etc.)
- Fully buffered for peace of mind.
- Firm mounting in BBC micro.
- Compatible with all BBC micros (not BBC+ or Master).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of Battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- Accepts any ROM.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE Fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROM-SPELL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM-RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM-RAM Board.

The ROM-RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, for later.

Please write in for further details.

INTRODUCTORY PRICES:

ROM/RAM card with 32k dynamic RAM	*£48*
ROM/RAM card with 64k dynamic RAM	*£65*
ROM/RAM card with a massive 128k dynamic RAM	£109

(carriage on ROM-RAM Card £3)

OPTIONAL EXTRAS:

16k plug-in Static RAM kit	£17
16k Dynamic RAM for Upgrade	£17.50
Battery backup	£3
Read and Write protect switches	£2 each
Complete ROM-RAM board All options installed	£115

P.S.

Is your existing ROM Board overflowing with ROMs? Do you need more Sideways RAM? Is your Board unreliable? Then upgrade to Watford ROM/RAM Board and pay £5 less

Le Modem

The MODEM from Watford

The features that make Le MODEM such good value are:

- *Auto Dials, Auto answers, and is completely controlled by your micro. There are no external controls!*
- *Allows you to access PRESTEL, B.T. GOLD, THE SOURCE, MICROLINK, MICRONET, MICROWEB, THE TIMES NETWORK, MICRO LIVE (BBC TV database), CITY BB and more.*
- *Supplied with a comprehensive telecomms package in a 16K sideways ROM which includes a FULL PRESTEL terminal allowing TELE-SOFTWARE to be downloaded.*
- *A comprehensive 80 column terminal. This includes XMODEM error checked transfer protocol, to allow error free data transfer anywhere in the world!*
- *FULLY controlled by simple "*COMMANDS allowing you to control it from your own BASIC programs. To get you started we supply a FREE disc of bundled software!*
- *Connects to the 1MHz bus. A *AUDIO ON-OFF command allows you to actually hear the telephone line through your BBC micro loudspeaker.*
- *Completely self contained with internal mains power supply. (Even a free mains plug is fitted!) A *TEST facility gives ON SCREEN indication that Le MODEM is working correctly.*
- ***FREE Registration to MicroLink.***

SALE OFFER £62 (carr £5)

(Price includes, Le Modem, Software ROM, Cables & Comprehensive Manual)
(Write in for further details)

APOLLO

The NEW Modem from Watford

Following numerous requests from you, our discerning customers for an APPROVED, Low Cost & High Performance modem with Auto Dial & Auto Answer facilities as standard) we bring you the versatile APOLLO Modem. Just compare the features and look at the price (which incidentally includes the cost of the Software, manual and BBC connecting cable). We are sure you will agree that Watford Electronics in their traditional way are giving you a super 'value for money' deal.

Just look at these features:

- V21 for Bulletin boards, Microlink, Telecom Gold, etc.
- V23 for Prestel, Home Banking, and other Viewdata services.
- Reverse V23 allows User run Viewdata service.
- 1200-1200 half duplex for communications.
- XMODEM, HEX and ASCII file transmission.
- Auto Dial of given 'phone number.
- Auto Answer for User's Bulletin Board.
- 80 column terminal with split screen facility.
- Prestel text screen dump.
- Fully BABT approved.
- **FREE Registration to MicroLink.**
- **£6.50 off annual Membership to Micronet, Prestel and Telecom Gold.**

Sale Offer: **£64** **(Carr £5)**
Price includes, the Modem, Comm Software Cables & Operating Manual).
(Write in for full specification)

NEW

Aries 1200 MODEM

APPROVED for connection to telecommunication systems specified in the instructions for use subject to the conditions set out in them.

If you thought £150 didn't buy much of a modem you haven't heard about the aries 1200

Up till now buying a modem was a compromise between price and performance, but the new Aries 1200 offers performance and features not found on modems costing two or three times as much. Look at the features offered by the Aries 1200, features which you wouldn't expect from a modem at this price – and some which you would be lucky to find on a modem at any price.

- Operates in V21 (300/300), V23 (1200/75 and 75/1200) and proprietary V23 1200 mode.
- Connect it to any type of computer or terminal via the 25 way serial D connector or the BBC standard 5 pin Domino socket.
- A built in phone socket means your phone plugs straight through.
- A reset switch so the hardware makes it easy to restart – even when your software doesn't.
- Industry standard Hayes (C) compatibility means that this is one of the easiest modems to use. It can automatically work out the speed your computer is working at, and even the speed and protocol of the modem at the other end.
- Auto Call mode can dial using tone or pulse (the modem works that out too), and when it connects it will automatically determine the speed of the answering modem.
- Auto answer mode means the modem can be left unattended to answer calls from other modems, and of course it automatically works out the speed and protocol of the calling modem.
- The built in speaker and front panel LED's mean that you always know what the modem is doing.

. . . Features at any price.

- Proprietary V23 mode mean that two Aries 1200's can communicate at 1200/1200 and in this situation you can take advantage of the built in data compaction which reduces the volume of text you send by 30%.
- Built in scrambler means that data transferred between two Aries modems is automatically encrypted. The encryption code can be user defined for a totally private email system.
- User defined control commands means that the Aries can even be used from a dumb terminal or with non standard software.
- Front panel light include indicators for Power, Auto Answer Mode, Transmit, Receive, On line, Terminal ready and Carrier Detect. There's even an indicator to show the quality of the phone line.
- Internal watch-dog monitors the modems activity and in the event of a power failure or computer crash it automatically resets the modem. The Aries modem can never hold open your phone line or lock up your computer.
- Built in printer port allows the Aries to direct incoming data directly to a printer, text can be tagged so that it is selectively sent either to the printer or the computer.
- All modem setting are stored in solid state non volatile memory – no battery to go flat and hang crash the system.

Launch Offer **Only: £149**

Hayes Compatible BBC Comms Software ROM & Manual **£25**

WATFORD CUT PRICES NOT PERFORMANCE

Continued →

COMPUTER CONCEPT'S ROMS

ACCELERATOR	£30
CARETAKER Basic Utility	£23
DISC DOCTOR	£28
Graphics ROM	£29
TERMI	£25
COMMUNICATOR	£49
Printmaster	£24

Wordwise £26

Wordwise plus £40

We are giving away absolutely **FREE**, the superb Word-Aid ROM worth £24, with every WORDWISE PLUS package bought from us.

Word-Aid

The most comprehensive utilities ROM for Wordwise-Plus

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

- Alphabetical sorting of names and addresses.
- Text transfer options.
- Chapter marker.
- Epson printer codes function key option.
- Search and display in preview mode.
- Embedded command removal.
- Print Multiple copies of a document.
- Multiple file options for print and preview.
- Address finder.
- Label printer.
- Mail-merger.
- Number/delete/renumber.
- Clear text-segment area.
- BBC B, B+ and Master compatible.

Only **£24**

(N.B. Word Aid requires a Disc Interface in your Micro)

HI-WORDWISE-PLUS DISC: £5

SPELL MASTER **£42**

Inter SHEET ONLY £37

INTER CHART ONLY: £25

Inter-WORD £36

MEGA-3 ROM

Interword, Intersheet & Interchart – 3 in one ROM £76

INTERBASE £49

All Prices Exclusive of VAT

VIEW

VIEW WORDPROCESSOR 2.1	£35
VIEW 3.0 ROM	**£48**
VIEW PROFESSIONAL	**£59**
HI-VIEW (for 6502 2nd Processor)	**£36**
VIEWSHEET (Acornsoft)	**£36**
VIEWSTORE	**£36**
VIEWSPELL with 80 track disc	**£29**
VIEWPLOT Disc (Please specify for Master 128 or Compact)	**£20**
VIEW-INDEX	**£12**
OVERVIEW Packs 1 & 2	**£69**

Watford's own Sophisticated VIEW PRINTER DRIVERS

Epson FX80 & Kaga KP (Disc)	£8
Juki & Brother HR15 (Disc)	£8
Silver Reed Printers (Disc)	£8

BBC SOFTWARE'S Popular Educational Software

● Maths with a Story 1 (Disc). 4 primary level maths programs	£11.25
● Maths with a Story 2 (Disc) 4 further maths programs	£11.25
● Picture Craft (Disc) 6 - 14 age group. Pack consists of flexible geometrical design & colouring programs	£17
● WAVES: Science Topics (Disc) CSC O Level Physics program.	£14.95
● RELATIONSHIP: Science (Disc) O Level Biology program.	£20.00
● BONDING: Science (Disc) O Level Chemistry program.	£20.00
● ELECTROMAGNETIC SPECTRUM (8 Discs) O Level program.	£20.00
● ELECTRONICS IN ACTION (Disc) O Level program	£19.95
● NEWTON & THE SPACE SHUTTLE (Disc) O Level program.	£20
● ECOLOGY (Disc) O Level program.	£20
● POLYMERS (Disc) O Level program.	£20
● Clasification & Periodic Table O Level. The suite is supplied with its own database of chemical elements which can be classified according to your own rule.	£20
● FOOD & POPULATION (Disc) O Level program.	£20
● MICROTECHNOLOGY (Cassette) O Level program.	£11.25
● A VOUS LA FRANCE (2 Cassettes) A French language home study aid.	£21.70
● DEUTSCH DIREKT! (Disc & Audio Cassette)	£19.95
● Modem Master (Disc)	£11.25
● ADVANCED TELETEXT SYSTEM	£8.65
● PERIOD TABLE SOFTWARE	£20
● Astronomy – Primary (Disc)	£12
● Computers at Work – Primary	£17.35
● Introducing Geography – Primary	£17
● **Introducing Geography 11-17yrs**	£17.50
● Electric Fields 6-14 years	£11.25
● BlackQueen Contract Bridge	£13
● Espana Viva – 3 Discs	£19.95
● A Vous La France Disc	£21.50

MINI OFFICE II

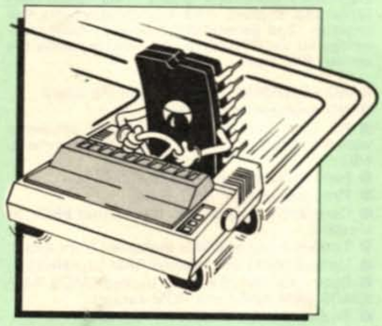
DISC Version for BBC B & B+	**£14.00**
DISC Version for BBC Master	**£16.50**
Disc Version for the Compact	**£18.00**

(When ordering please specify for which Micro & 40 or 80 track Disc).

Advanced Computer Products

Advanced Disc Toolkit	£30
Advanced Disc Investigator	£25
Advanced 1770 DFS BBC	£29
Advanced 1770 DFS Master	£30
Advanced File Manager	£25.00
Advanced Control Panel	£30.00

VIEW PRINTER DRIVER ROM



View is a powerful word processor, but until now has seriously lacked in terms of printer support. With the launch of our Printer Driver ROM, which includes an extremely powerful and easy to use Printer Driver Generator, View users can find themselves in the realms of advanced word processing only at a small outlay.

The VPD extends View's printer command with a series of mnemonic commands. All standard highlight sequences are also supported. A large range of printers are supported by drivers contained within the ROM (the drivers can be downloaded and customised). Printers supported include: Epson's MX, RX, FX, FX, LX, JX80 range, HI80, KP810/910, PW1080, JP101, HR15, M1009, GLP, Panasonic KX-P1081/2, JUKI 6100, etc.

Other printers are readily supported by defining a Printer Driver using the built in Printer Driver Generator. The features mentioned below are available to both the built in Printer Drivers and user defined drivers (assuming the printer supports the features).

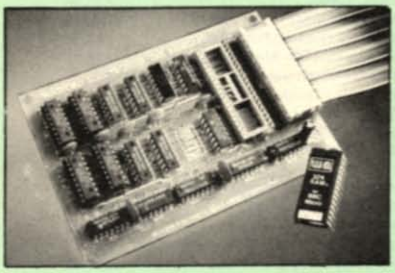
NLQ control, Underline, Bold, Proportional Spacing, Microspacing, Italic, Superscript, Subscript, Condensed, Enlarged, Double Strike, Set lines per inch numerically (e.g. LPI 6), Set characters per inch numerically (e.g. CPI 5), Select printer font, Select printer ribbon colour, Translation sequences, Emulation of BBC Character Set, Simple numeric expressions for certain operations, Full printer setup, Send control codes, Print prompt on screen, Redefinable Pad character, Pause for key press, Prompt to change daisywheel, and Execute * command when printing.

Other features include a very powerful on screen preview, with bold, italic, underline, super/subscript, enlarged highlights, and a special printer driver to allow memory based text to be previewed by View 1.4. Of course, View 1.4, 2.1 and 3.0 are all supported, as is Shadow RAM and 6502 Second Processors. The BBC B series and Master series of micros are supported. A comprehensive manual is supplied. All in all, a very professional product for the discerning user who wants power at their finger tips. (Write in for a detailed leaflet).

Price: Only £33

32K

SHADOW RAM-
Printer Buffer
Expansion Board



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Don't throw away your BBC B for a BBC B Plus or BBC Master. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16K or even 20K, but a massive 32K of extra RAM!!!

● IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer – type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.

● "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28,000 bytes free – 5 times as much as normal.

● In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24K of text in memory. This product is recommended as an ideal complement by Computer Concepts.

● Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20K of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28K of program space.

● Use the FULL 32K or the bottom 12K of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS423 etc. Print large text files while running long graphics programs, and have all your buffer options available as well (*FX15,21,138,145,ADVAL etc). Please note only a 12K printer buffer can be used with Wordwise or Wordwise-Plus, due to the way they are written.

● Unique facility to turn ROMs off and on again. Unlike all other ROM managers, this feature does not use 'unofficial' memory. Two bytes of normally user-inaccessible memory on the RAM card are used to ensure ROMs are disabled WHERE OTHER ROMS FAIL.

● Recommended by Computer Concepts for use with their Inter series of ROMs.

Only £59 (carr £2)

(Price includes a comprehensive manual and the ROM)

INCREDIBLE WORDPROCESSING DEAL

Watford's 32K SHADOW RAM CARD and Computer Concept's INTERWORD Wordprocessor package.

at Only **£89** (carr £2)

ROM MANAGER

ROM
MANAGER
DFS

Take control of your Sideways ROMs with ROM Manager. This powerful utility ROM gives you power over your sideways ROMs. Disable whole ROMs, send commands directly to named ROMs and many other powerful facilities.

"Provides comprehensive management of all your installed ROMs". (BEEBUG November '84.)

ONLY £20

ADDER

The only low cost EPROM Programmer for the BBC Micro that will program both the standard 21V and the new 12V5, 27128 EPROMS.

Adder is the ultimate EPROM programmer for the BBC Micro. It will program many different EPROMs up to the very latest 27256 32K devices.

The Adder unit connects to the User Port and draws its power from there too. The EPROM is mounted in a top quality ZIF socket. There are no switches or controls as Adder is entirely software controlled.

The Adder software provides sophisticated facilities for programming EPROMs from a RAM image produced by loading disc files. The software is menu driven and designed for ease of use.

Features:

● Two ultra fast programming algorithms or standard slow algorithm.

● Supports standard 21V programming and newer 12.5 volt EPROMs. (Software switched).

● The RAM image to be programmed can be built up in many ways. Sections of image can be loaded separately. Part programming. Read EPROM. Edit data in memory.

● Automatic processing to handle a list of files to program into the EPROM.

● Automatic disc buffering to allow programming of 32K 27256 devices from a 32K file without extra effort.

● Verification gives detailed error list and checksums are maintained. There is also a blank check facility.

● Works with all standard filing systems. Generates header code for RFS ROMs to allow Basic programs etc. to be stored in EPROM. More than one file per ROM permitted.

● Programs the following EPROMs:
From 2K to 32K: 2516, 2716, 2532, 2732, 2764, 2764A, 27128, 27128A, 27256 (Both 12.5V and 21V).

£72 (£5 Carr)

TEX EPROM ERASERS

EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs! The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast. We use these erasers for all our own erasing work.

● **ERASER EB** – Standard version erases up to 16 chips.	**£28** (carr £2)
● **ERASER GT** – Deluxe version erases up to 18 chips. Has automatic safety cut-off to switch off the UV lamp when opened.	**£30** (carr £2)
● Spare UV tubes.	**£9**

OFFICE MASTER

CASHBOOK – A complete "Stand Alone" accounting software package for the cash based sole trader/partnership business. It is designed to replace your existing cashbook system and will provide you with a computerised system complete to trail balance.

FINAL ACCOUNTS – Will take data prepared by the Cashbook module and produce a complete set of accounts as following: Trial Balance with inbuilt rounding routine; Notes to the accounts; VAT Summary; Profit & Loss A/C; Balance Sheet.

MAILIST – A very versatile program. Enables you to keep records of names and addresses and then print, examine, sort and find them, all with special selection techniques.

EASILEDGER – A management aid software tool designed to run alongside an existing accounting system. Essentially a Debit/Credit ledger system which can handle sales, purchase and nominal ledger routines to provide instant management information.

INVOICES & STATEMENTS – Greatly reduces the time and cost of preparing Invoices and Statements by storing essential information like customer names, addresses and account numbers. Has VAT routines and footer messages facility.

STOCK CONTROL – Allows you to enter stock received, stock out, summary of stock items and current holdings together with details of total cost, total stock to minimum level, units in stock ordering, quantity and supplier detail.

All this for only **£21** (Disc)

OFFICE MATE

● DATABASE
● BEEBCALC SPREADSHEET
● BEEBPLOT GRAPHICS

DATABASE – Set up a computerised card index system with powerful search facilities.

SPREADSHEET – Offers many calculation and editing features.

BEEBPLOT – Provides visual representation from Spreadsheet data.

OFFICE MATE Only £10 (Disc)

Disc Drives DP35-800S

A Double disc drive – with a difference! Times are changing fast for the floppy disk, and whilst the current standard for the BBC B and Master Series is the 5.25 inch disk, the standard for the future will most certainly be the smaller; faster and more reliable 3.5 inch disks – now a standard feature of both the Master Compact and the Archimedes Series.

To support the present disc drive users, and cope with the future, we have designed our own plinth-mounted disk system – called the DP35 800S, it contains both the 5.25 inch and the 3.5 inch drive formats as well as offer a firm and rigid support for a monitor on top. With the BBC Micro underneath, the plinth makes a surprisingly small footprint on the desk – leaving you more space to work with.

The 5.25" disc drive is 40/80 track switchable. For ease of access, the switches are front mounted. DP35-800S has its own power supply, independent of the BBC Micro.

Watford's new plinth enables users to read, write and format disks both in DFS and ADFS format – currently the accepted standard for the Master Compact and the Archimedes, it also enables the user to read disks written for the Archimedes. Ideal for both BBC & Master.

Launch Offer: **£165** (carr. £7)

Continued

BOOKS (No VAT on Books)

15 Hr Wordprocessing BBC/View	£5.95
15 Hr Wordprocessing BBC/WW & WW+	£5.95
30 Hour BASIC (BBC Micro)	£12.95
6502 Assembly Language Programming	£19.95
6502 Application	£13.95
6502 Development Package	£7.50
6502 Programming the	£16.95
6502 Reference Guide	£10.95
68000 Assembly Language	£15.95
68000 Assembly Language Prog.	£10.95
68000 Assembly Language Techniques	£24.95
68000 Machine Code Programming	£13.00
68000 Microprocessor Handbook	£14.95
68000 Programming the	£22.95
68000 User Guide	£8.95
6809, Programming the	£18.95
Advanced Disc User Guide	£18.95
Advanced Prog. Guide to BBC	£9.95
Adv. Sideways RAM User Guide	£9.95
Advanced User Guide for BBC	£10.95
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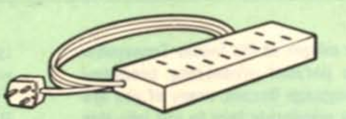

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Program in parallel

Add Basic multi-tasking to your BBC Micro with Chris Nixon's powerful assembler utility

WITH the advent of the Inmos Transputer and its parallel processing programming language Occam, many of you are perhaps wondering how to get into this fascinating field of computing. Obviously, the BBC Micro can't run quite as fast as a motherboard containing 32 linked transputers, but we can still experiment and add some multi-tasking commands to BBC Basic.

The idea behind parallel processing is that all computers – whether micros, minis or mainframes, are basically Von Neumann in their operation. It was this American who laid down the fundamentals of how a computer should operate and he did this with such foresight that his principals still operate today in the BBC Micro.

Basically, the central processing unit – CPU – in a Von Neumann machine can only process one instruction at a time. In fact even the famous Transputer is Von Neumann, but is designed to work with other similar processors. Each can only process one instruction at a time but the set is actually running several tasks simultaneously – the tricky part being for the chip to process and integrate the results of all these separate calculations.

This is the difference between parallel processing and multi-tasking. The latter is a clever way of making a Von Neumann machine, such as the Archimedes or the BBC Micro, behave as if it were actually performing parallel processing. What is really happening is that the micro is rushing around from program to program at high speed giving the illusion of several independent programs running simultaneously.

This method – multi-tasking – is what we're going to implement on our BBC Micro. Program I is an assembly language listing called Multi-Task which adds four new commands to BBC Basic. Type in the listing, ensure it is correct using Get it Right! and save it as anything other than M-TASK.

When run, a machine code program called M-TASK will be saved to disc or tape. To load and run Multi-Task subsequently just type *M-TASK or have it as the first line in a program. Note that you must replace the values assigned to *checkend* and *continue* near the start of the program with those that correspond to your particular machine's version of Basic. These are all given in REM statements in lines 160 to 190.

All the extra commands provided, together with their proper syntax, are shown in Table I. The most important is the EVERY statement which lets you tell Basic to execute any subroutine you like every time a specified amount of time has elapsed. For example, the following program, which you may like to try, will repeatedly print the value held in the pseudo-variable *TIME* at the top of the screen at very short time intervals.

```
10 *M-TASK
20 EVERY 1 GOSUB 100
30 GOTO 30
100 PRINT TAB(0,0);"TIME: ";TIME
110 RET
```

This example illustrates several important aspects of Multi-Task. Firstly, the time interval specified after the EVERY command cannot be regarded as an exact value. This is because although the digit used – which may be zero to nine inclusive and represents fiftieths of a second – Basic cannot be interrupted at these precise intervals. Instead, it must be left to finish executing the current statement, after which it checks the Escape flag in page zero to see if Escape has been pressed.

Multi-Task makes use of this feature to interrupt Basic by generating the Escape code from software at the exact intervals specified in the EVERY command, but we then have to wait for Basic to read the flag and generate the Escape error after it has finished executing the current statement. Any errors, including error 17 – the Escape error – are channelled through the Break vector at ram locations &202-3, so Multi-Task diverts this vector right at the start to point to its own error checking routine.

It is there that the error is checked to see if it is

The Von Neuman concept

Jon Von Neuman (1903-1957) was a computer scientist during the Second World War. In 1946 he published a paper in which he envisaged a machine controlled by a set of instructions with a small number of central processing elements. This theoretical basis has not changed even in modern micros. The concept of a stored program described in the paper is:

- **Binary code is used to represent all data and instructions and they are stored together in the computer's memory.**
- **No distinction between data and instructions is made by the computer.**

The speed of a Von Neuman machine is limited by the rate at which it can get instructions and data from its memory and process them one at a time.

EVERY <0-9> GOSUB <line number>	Cause Basic to call the subroutine at <line number> every <0-9> +1 50ths of a second.
RET	Return from subroutine to main program.
PAUSE	Temporarily disable Multi-Task.
RESUME	Re-activate Multi-Task.

Table I: Multi-Task commands and their syntax

Bad Timer	A character other than a digit between 0 and 9 inclusive was found after an EVERY command.
No GOSUB	There is no GOSUB present after an EVERY command.
No such line	The line specified after the GOSUB does not exist.
EVERY in progress	An EVERY has been encountered while one is already active, or an EVERY has been issued from the keyboard.
Can't RET	A RET has been encountered while not inside a Multi-Task subroutine.
Can't RESUME	A RESUME has been encountered when no EVERY has been issued.

Table II: Multi-Task error messages

Escape. If Multi-Task is currently active and the Escape key is not being physically pressed, Basic will commence execution at the line specified after the GOSUB, otherwise control will be returned to Basic's own error handler.

The next point to note is the RET command at line 110. This is used by Multi-Task to signal a return to the main program, exactly as if a RETURN had been used. These are the two most important commands for controlling Multi-Task, but there are two others:

- PAUSE may be used at any point inside the main program to cause Multi-Task to suspend its operation temporarily, returning full control to the main program. This is useful in time critical parts of a program, because Multi-Task can slow Basic down considerably, depending on the size of the event-driven subroutine.
- RESUME will re-activate Multi-Basic without the need to issue another EVERY command; it can only be used if an EVERY has already been used.

Program II is a demonstration of Multi-Basic which bounces two squares around a Mode 4 screen. The first is under direct control of the main program, while the second square moves more slowly under the control of Multi-Task. The beauty of Multi-Task is that the main program is blissfully unaware that it is constantly being interrupted to run another piece of code – it is therefore essential to use different variable names in the subroutine to those used in the main program, unless you are very sure of what you are doing.

Pressing the spacebar at any point in the demonstration program issues a PAUSE command, turning off the second square and speeding up the first, as the main program regains all of the 6502's processing time. Pressing Return after the spacebar has been pressed issues a RESUME, re-activating the second square.

While playing about with this program you will see that you can issue a RESUME command without having PAUSEd first. This is because RESUME first checks whether an EVERY is active before enabling the event used by Multi-Task, and re-enabling the event cannot hurt if it is already active.

Unfortunately you cannot issue an EVERY command directly from the keyboard – well, actually you can, but it will generate one of Multi-Task's error messages. This is due to the fact that when Multi-Task encounters a RET it attempts to return to the point Basic was last at. If this was simply the system prompt, as it will be if you typed the command at the keyboard, unpredictable effects will occur. Hence line 30 continuously jumps to itself, as the program must not be allowed to end with Multi-Task active.

To get around this problem use PAUSE just before an END statement when you have finished. The example with the bouncing square can be exited by pressing Escape, as Multi-Basic reads the keyboard to see whether any Escape error is physical or generated by software. All such real errors will automatically execute a PAUSE command, halting execution of the current Multi-Task subroutine.

Table II is a list of all errors generated by Multi-Task during the course of a program, together with explanations. Now you can have some real fun with programming, knowing that your BBC Micro boasts true multi-tasking capabilities.

```
 10 REM Multi-Task
 20 REM by Chris Nixon
 30 REM (c) The Micro User
 40 MODE7
 50 jmpvec=&70:basrom=&72:base=&73
 60 count=&75:temp=&76:gosub=&77
 70 timer=&79:ptr=&7A:linenum=&7C
 80 byte1=&7E:byte2=&7F:byte3=&80
 90 eflag=&81:gflag=&82:return=&83
100 flag=&85:x=&86:y=&87
110 checkend=&9857
120 REM &9810 for Basic 1
130 REM &9BA6 for Master 128 & Compact
140 REM &D07C for Hi-Basic
150 continue=&8B9B
160 REM &8B0C for Basic 1
170 REM &9005 for Master 128
180 REM &8998 for Master Compact
190 REM &C398 for Hi-Basic
200 FORL%=0TO2STEP2:P%=&900
210 [OPT L%
220 LDA #187:LDX #0:LDY #255:JSR &FFF4
230 STX basrom:LDA &203:BPL skipvec
240 STA &231:LDA &202:STA &230
250 LDA #error MOD 256:STA &202
260 LDA #error DIV 256:STA &203
270 LDA #event MOD 256:STA &220
280 LDA #event DIV 256:STA &221
290 .skipvec
300 SEI:LDA basrom:STA &FE30:STA &F4
310 CLI:LDA #0:STA eflag:STA flag:RTS
320 .error
330 PHA:TXA:PHA:TYA:PHA:LDY #0
340 LDA (&FD),Y:CMP #4:BEQ interpret
350 CMP #17:BNE mistake:LDX #&8F
360 LDY #&FF:LDA #&81:JSR &FFF4
370 CPX #&FF:BEQ mistake:LDA #1
380 STA gflag
390 PLA:PLA:PLA:PLA:PLA:PLA
400 LDY #50
410 .saveZP
420 LDA 0,Y:STA &C00,Y:DEY:BPL saveZP
430 LDA #124:JSR &FFF4:LDA #134
```

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```
440 JSR &FFF4:STX x:STY y:LDA gosub
450 STA &B:LDA gosub+1:STA &C:LDA #4
460 STA &A:JMP continue
470 .mistake
480 LDA #13:LDX #4:JSR &FFF4
490 LDA #0:STA eflag:STA gflag
500 PLA:TAY:PLA:TAX:PLA:JMP (&230)
510 .interpret
520 LDX #0
530 .wordlp
540 LDY &A:DEY:LDA comtab,X
550 BEQ mistake
560 .bytelp
570 LDA (&B),Y:STA temp:LDA comtab,X
580 CMP #13:BEQ found:CMP temp
590 BNE nextword:INX:INY:JMP bytelp
600 .nextword
610 INX:LDA comtab,X:BNE nextword
620 INX:JMP wordlp
630 .found
640 STY &A:LDA comtab+1,X:STA jmpvec
650 LDA comtab+2,X:STA jmpvec+1
660 PLA:PLA:PLA:PLA:PLA:PLA:PLA
670 JMP (jmpvec)
680 .event
690 PHP:PHA:TXA:PHA:TYA:PHA
700 DEC count:BMI boot:.exit
710 PLA:TAY:PLA:TAX:PLA:PLP:RTS
720 .boot
730 LDA #218:LDX #0:LDY #&FF:JSR &FFF4
740 CPX #0:BNE exit:LDA #13:LDX #4
750 JSR &FFF4:LDA #125:JSR &FFF4
760 LDA timer:STA count:JMP exit
770 .every
780 JSR strip:CMP #48:BCC error0
790 CMP #58:BCS error0:SEC:SBC #48
800 ASL A:ASL A:ASL A:STA timer
810 INC timer:JSR strip
820 CMP #&E4:BNE error1:JSR strip
830 JSR decode:JSR findline
840 BCC error2:LDA eflag:BNE error3
850 LDA gflag:BNE error3
860 LDA #1:STA flag:JMP resume
870 .error0
880 LDA #0:JMP MBerr
890 .error1
900 LDA #1:JMP MBerr
910 .error2
920 LDA #2:JMP MBerr
930 .error3
940 LDA #3:JMP MBerr
950 .strip
960 JSR getchar:CMP #32:BEQ strip:RTS
970 .getchar
980 LDY &A:LDA (&B),Y:INC &A:RTS
990 .decode
1000 CMP #&8D:BNE error2:JSR getchar
1010 STA byte1:JSR getchar:STA byte2
1020 JSR getchar:STA byte3:LDA byte1
1030 ASL A:ASL A:PHA:AND #192:EOR byte2
1040 STA linenum:PLA:ASL A:ASL A
1050 EOR byte3:STA linenum+1:RTS
1060 .findline
1070 LDA #0:STA ptr:LDA &18:STA ptr+1
1080 .findlp
1090 LDY #1:LDA (ptr),Y:CMP #&FF
1100 BEQ nosuch:CMP linenum+1
1110 BNE nextline:INY:LDA (ptr),Y
1120 CMP linenum:BEQ linefound
1130 .nextline
1140 LDY #3:LDA (ptr),Y:CLC:ADC ptr
1150 STA ptr:LDA ptr+1:ADC #0:STA ptr+1
1160 JMP findlp
1170 .linefound
1180 LDA ptr:STA gosub
1190 LDA ptr+1:STA gosub+1
1200 SEC:RTS
1210 .nosuch
1220 CLC:RTS
1230 .error5
1240 LDA #5:JMP MBerr
1250 .resume
1260 LDA flag:BEQ error5:LDA timer
1270 STA count:LDA #1:STA eflag:LDA #14
1280 LDX #4:JSR &FFF4:JSR checkend
1290 JMP continue
1300 .error4
1310 LDA #4:JMP MBerr
1320 .ret
1330 LDA gflag:BEQ error4
1340 LDA #0:STA gflag
1350 LDY #50
1360 .loadZP
1370 LDA &C00,Y:STA 0,Y:DEY:BPL loadZP
1380 LDA #31:JSR &FFEE:LDA x:JSR &FFEE
1390 LDA y:JSR &FFEE:LDA eflag:BNE on
1400 RTS
1410 .on
1420 LDA #14:LDX #4:JMP &FFF4
1430 .cancel
1440 LDA #0:STA eflag
1450 LDA #13:LDX #4:JSR &FFF4
1460 JSR checkend:JMP continue
1470 .MBerr
1480 PHA:LDA #13:LDX #4:JSR &FFF4
1490 LDA #0:STA eflag:STA gflag:PLA
1500 ASL A:TAX:LDA errtab,X:STA &50
1510 LDA errtab+1,X:STA &51:JMP (&50)
1520 .errtab
1530 OPT FNw(e0)
1540 OPT FNw(e1)
1550 OPT FNw(e2)
1560 OPT FNw(e3)
1570 OPT FNw(e4)
1580 OPT FNw(e5)
1590 .e0
1600 BRK:BRK:OPT FNs("Bad timer"):BRK
1610 .e1
1620 BRK:BRK:OPT FNs("No GOSUB"):BRK
1630 .e2
1640 BRK:BRK:OPT FNs("No such line"):BR
K
1650 .e3
1660 BRK:BRK:OPT FNs("EVERY in progress
"):BRK
1670 .e4
1680 BRK:BRK:OPT FNs("Can't RET"):BRK
1690 .e5
1700 BRK:BRK:OPT FNs("Can't RESUME"):BR
K
1710 .comtab
1720 OPT FNs("EVERY"):OPT FNb(13):OPT F
Nw(every):BRK
1730 OPT FNs("RESUME"):OPT FNb(13):OPT
FNw(resume):BRK
1740 OPT FNs("PAUSE"):OPT FNb(13):OPT F
Nw(cancel):BRK
1750 OPT FNs("RET"):OPT FNb(13):OPT FNw
(ret):BRK
1760 BRK
1770 ]:NEXT
1780 $&700="SAVE M-Task 900 "+STR$~P%
1790 X%=0:Y%=7:CALL&FFF7:END
1800 DEFFNb(N%):?P%=N%:P%=P%+1:=L%
1810 DEFFNw(N%):!P%=N%:P%=P%+2:=L%
1820 DEFFNs(N$):$P%=N$:P%=P%+LENN$:=L%
```

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```
  10 =    0 0
  20 =    0 0
  30 =    0 0
  40 = 8AFC C
  50 = A9C6 8
  60 = 8602 2
  70 = DC4A 4
  80 = CC49 9
  90 = 8C2A 5
 100 = 6925 9
 110 = 999A A
 120 =    0 A
 130 =    0 A
 140 =    0 A
 150 = BA4C 5
 160 =    0 5
 170 =    0 5
 180 =    0 5
 190 =    0 5
 200 =  8DE 5
 210 = 1EF3 7
 220 = C5D4 C
 230 = 7CC9 D
 240 = 6E4F B
 250 = 8421 2
 260 = 62C2 3
 270 = 586D A
 280 = BE8E 8
 290 = 1447 D
 300 = F5B8 4
 310 = 96C0 1
 320 = D394 F
 330 = 10AE F
 340 = 891E 3
 350 = 6FAA D
 360 = 4D82 6
 370 = C119 9
 380 = 7FFC 1
 390 = F066 7
 400 = 7A93 B
 410 = CA79 5
 420 = DF38 8
 430 = 4B6E 6
 440 = 339C 6
 450 = A22A 1
 460 = CDBF 6
 470 = 97CB D
 480 = 95F8 F
 490 = 17EE A
 500 = 9B28 7
 510 = 17C3 E
 520 = EA45 9
 530 = 75E0 E
 540 = 76E7 3
 550 = BAD2 1
 560 = F513 2
 570 = 644A 3
 580 = 8DB1 2
 590 = A1CD 5
 600 = 37DA C
 610 = 35D0 7
 620 =  2AB F
 630 = DB31 D
 640 = 6DDF 5
 650 = AFED 6
 660 = B287 6
 670 = 3959 6
 680 = 8C61 E
 690 = A5E9 D
 700 =  2B0 5
 710 = 3B90 3
 720 = E1FB E
 730 = 4496 2
 740 = 9DB7 A
 750 =   BC 8
 760 = 74A1 5
 770 = 1BD2 D
 780 = 7701 0
 790 = 20EB F
 800 = 750C 6
 810 = 638F E
 820 = 4477 2
 830 = 5919 D
 840 = D4F0 0
 850 = 1A48 8
 860 = 1D20 2
 870 = 594D 0
 880 = 40A9 C
 890 = 496C E
 900 = 98E0 A
 910 = 790F 6
 920 = E01A E
 930 = 692E 5
 940 = 3853 5
 950 = B736 6
 960 = 7262 2
 970 = 51B4 1
 980 = 7583 D
 990 = B1F5 F
1000 = 5C05 D
1010 = 9ED3 E
1020 = 3364 9
1030 = 3250 E
1040 = E726 C
1050 = FD2F 5
1060 =  973 2
1070 = CFD0 9
1080 = B3D4 0
1090 = E431 0
1100 = 4A23 3
1110 = 6656 4
1120 = F4A0 4
1130 = D6FD 8
1140 = 64F7 A
1150 = 746A 4
1160 = AD09 4
1170 = 6A6C B
1180 = 1F84 6
1190 = AD74 D
1200 = 38BF 6
1210 = A666 B
1220 = 4726 C
1230 =  9E8 E
1240 = C9A7 F
1250 =  30D 6
1260 = 7284 F
1270 = 9F6E 7
1280 = 1F52 C
1290 = 3842 7
1300 = 19C9 A
```

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VISA

◄ From Page 108

```
1310 = 11EE 4    1570 = A1A4 D
1320 = E9B0 3    1580 = 9295 0
1330 = 5CCD 7    1590 = 5F4B E
1340 =  3AC 6    1600 = EB7F 2
1350 = 7A93 D    1610 = 4F6A D
1360 = A7EC 3    1620 = D792 F
1370 = 8D25 9    1630 = 7F09 E
1380 = 6E98 9    1640 = C141 C
1390 = D441 8    1650 = 6F28 1
1400 = 9843 F    1660 = DC95 3
1410 =  BBB 8    1670 = 1FCF E
1420 = A66B 0    1680 = 43AD 1
1430 = 1E4D 4    1690 =  FEE D
1440 = 472F 2    1700 = DD17 1
1450 = 95F8 1    1710 = A1C0 7
1460 = B8D2 7    1720 = BC29 B
1470 = 4638 4    1730 = D6A9 9
1480 = 6128 6    1740 =  AE8 F
1490 = FB72 1    1750 = 96AC A
1500 = 9D7E 2    1760 = E2BF 5
1510 = A997 A    1770 = DA42 0
1520 = C648 C    1780 = 1793 A
1530 = 6D60 4    1790 = 1EC4 B
1540 = 5E51 8    1800 = E266 B
1550 =  B02 0    1810 = A49C 2
1560 = 3833 6    1820 = A13F B
```

```
 10 REM Multi-Task Demo
 20 REM by Chris Nixon
 30 REM (c) The Micro User
 40 *M-TASK
 50 MODE4:VDU23;8202;0;0;0;
 60 PROCsetup
 70 EVERY 0 GOSUB 280
 80 REPEAT:PROCball:UNTIL0
 90 DEFPROCsetup
100 MOVE0,0:DRAW1279,0:DRAW1279,1023
110 DRAW0,1023:DRAW0,0
120 X%=RND(38):Y%=RND(30)
130 x%=RND(38):y%=RND(30)
140 XD%=1:YD%=1:xd%=-1:yd%=-1
150 ENDPROC
160 DEFPROCball
170 IF INKEY(-99) PAUSE
180 IF INKEY(-74) RESUME
190 X1%=X%+XD%
200 Y1%=Y%+YD%
210 IF X1%=39 X1%=38:XD%=-1
220 IF X1%=0 X1%=1:XD%=1
230 IF Y1%=31 Y1%=30:YD%=-1
240 IF Y1%=0 Y1%=1:YD%=1
250 VDU31,X1%,Y1%,ASC"*"
260 VDU31,X%,Y%,32
270 X%=X1%:Y%=Y1%:ENDPROC
280 REM Multi-Tasking Subroutine
290 x1%=x%+xd%
300 y1%=y%+yd%
310 IF x1%=39 x1%=38:xd%=-1
320 IF x1%=0 x1%=1:xd%=1
330 IF y1%=31 y1%=30:yd%=-1
340 IF y1%=0 y1%=1:yd%=1
350 VDU31,x1%,y1%,ASC"+"
360 VDU31,x%,y%,32
370 x%=x1%:y%=y1%
380 RET
```

✓ Get it right!

```
 10 =    0 0    140 = B026 D
 20 =    0 0    150 = ED0F A    270 = 7753 9
 30 =    0 0    160 = 6AAE 3    280 =    0 9
 40 = A731 1    170 = 680D 6    290 = 8256 F
 50 = BA2D 9    180 = 81DE 0    300 = 9F83 C
 60 = 81CC 8    190 =  E73 A    310 = FC15 8
 70 = 7CF4 9    200 = 13A6 A    320 = C076 1
 80 = 3C88 C    210 = 3A67 7    330 = F0FA 2
 90 = 2AA8 2    220 = 69F4 6    340 = A28C 5
100 = CE15 5    230 = 3688 4    350 = 85FA 5
110 = 7549 6    240 =  B0E 7    360 = 51C0 B
120 = 5533 6    250 = A303 2    370 = FA66 3
130 = 1259 F    260 = 221C 9    380 = D8E6 3
```

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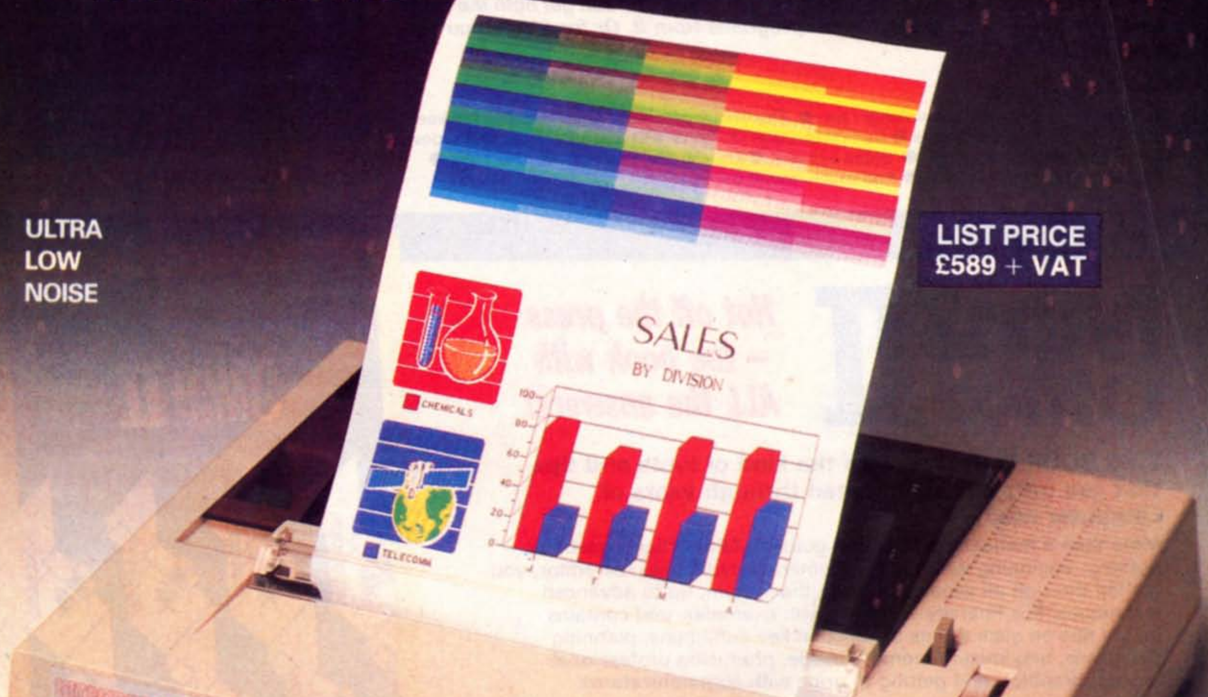
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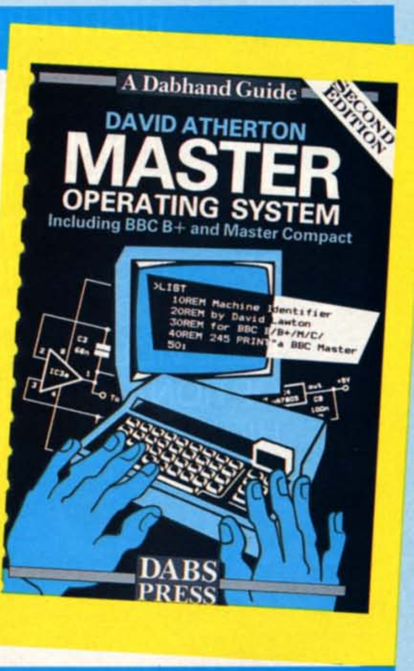
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Archimedes SOFTWARE QUICKIES

Pres Utilities ...three out of six

Petra Galloway investigates a disc-based utilities kit

THE six utilities available on this disc are all located in a single module which is just 7k long. Clicking it from the DeskTop loads it up and you're ready to go.

The command **Filetypes** gives a complete list of all the file types currently defined along with their hex code, which can be useful. However a much more extensive program that did the same job appeared in the February 1988 issue of *The Micro User* and with the Risc OS it becomes completely unnecessary.

HBackup copies the entire contents of your hard disc to a whole string of floppies. Again useful, but only if you've got the necessary hardware. The floppies you backup on to are not ADFS compatible and can only be used to restore the data. There's no separate command to do this, so there's a slight risk of destroying everything if you specify the drives wrongly.

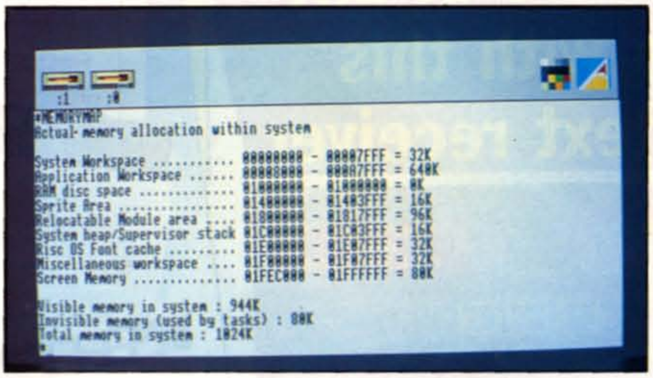
MemoryMap displays a table showing the current memory allocations to the various parts of the machine. On the Risc OS it also lists what memory is being held by tasks. However the task display on the Risc OS itself is much more graphic and allows dynamic adjustment of the values.

Modes lists all the screen formats available – including those user-defined ones that can be specified by modules. The information covered includes the text dimensions, number of colours – 64 for 256 colour mode – size required in *k* and any special features, such as non-graphic or teletext. This command is genuinely useful if you need to know – but Wimp-based programs are intended to be mode-independent.

ReCompact ensures that the ADFS recovers all available space on a disc without the need to continually reissue the Compact command.

RMInfo can generate a vast amount of data if you're not careful. However that is its purpose. What it does is list all the discernable information about software modules such as name, help info, memory used, SWIs if there are any, all the keywords and their help strings.

Of the six utilities only three are really worthwhile, or just two if you lack a hard disc. However, if you do have one the backup facility outstrips all the others and is worth the cost on its own.



```
*MEMORYMAP
Actual memory allocation within system

System Workspace ........... 00000000 - 00007FFF = 32K
Application Workspace ...... 00008000 - 000A7FFF = 640K
RAM disc space ............. 01000000 - 01000000 = 0K
Sprite Area ................ 01400000 - 01403FFF = 16K
Relocatable Module area .... 01800000 - 01817FFF = 96K
System heap/Supervisor stack 01C00000 - 01C03FFF = 16K
Risc OS Font cache ......... 01E00000 - 01E07FFF = 32K
Miscellaneous workspace .... 01F00000 - 01F07FFF = 32K
Screen Memory .............. 01FEC000 - 01FFFFFF = 80K

Visible memory in system : 944K
Invisible memory (used by tasks) : 80K
Total memory in system : 1024K
*
```

Memory Map in operation

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Tel: 0276 72046

QCS-Diary ...no thanks

Teri Paul makes a date with her Archimedes

THE DeskTop diary on the original Arthur operating system had its drawbacks and doesn't exist at all on the Risc OS, so if you need one what can you use? One product you might consider is the QCS-Diary from Quercus Computer Systems which works with the Risc OS although it's not multi-tasking as it doesn't use the Wimp environment.

When run you are presented with an attractive light blue background with big 3D plinths on which the text is presented. The first diary found on the disc is loaded automatically and you have the choice of moving to it or activating the Help option.

Help is presented by subject rather than being context-sensitive but is quite adequate – there's very little hard copy documentation – and the program is, in any case, simple to use.

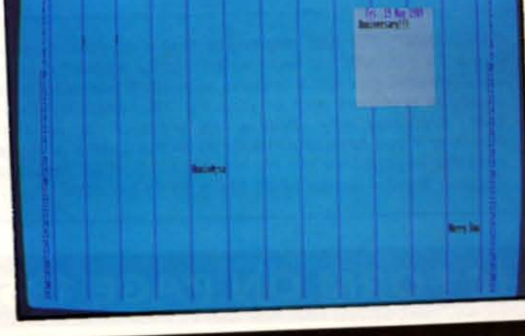
The diary screen uses Mode 15 so that needs to be configured – the software is a bit unfriendly here because if insufficient screen space is allocated all you get is a window with *Bad mode @ 11200* and no mention of what to do about errors.

Once you get to the diary proper you are presented with a full year planner with months across the top and days down the side with the first line of any entry displayed in the appropriate position. All you do is point at a day and click Select to bring up a window. Clicking Select on the window lets you enter 10 lines of about 20 characters.

This format is compatible with the original DeskTop diary files which can be loaded by the program. Using Adjust you can drag a diary entry to another date and Menu brings up a general printing, loading and saving panel.

Printing can be either a full month or a short list where only days with entries are printed in list form. The months can be chosen so you don't get the full year each time. There is a printer driver generator if you have an unusual type, but the Epson-compatibles are catered for by default.

QCS-Diary is adequate but lacks the qualities that make a really useful program. In addition the use of mouse and keyboard lacks cohesion and failure to use the Wimp means that, although it works, it can't make an easy transition to the new environment.



QCS – Diary main screen: Selecting a date

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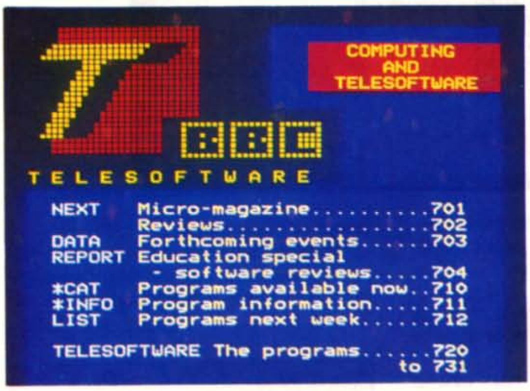

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TO ORDER PLEASE USE THE FORM ON PAGE 135

Enter Einstein

In anticipation of Acorn, Mike Cook reveals what the future holds

GETTING locked into a system of puns is one of those strange failings computer designers suffer from. The first successful Acorn machine was called the Atom. If the BBC hadn't endorsed the next machine it was going to be the Proton, and then we had the Electron, when it was rumoured that second processors were to be known as Gluons.

Having got nuclear physics out of its blood, Acorn seems to have gone classical on us. First we had the Archimedes and now we have Plato, Aristotle and Socrates. Let me explain: Plato is the concept, Aristotle the implementation and Socrates the next step.

Acorn has been very successful with the revolutionary Risc design, but the basic chip has been out for more than three years now and the designers have been concentrating on the next big breakthrough, that of employing lots of Risc chips in parallel, hence Plato. Like many things in computing, this is an acronym standing for Parallel Logic Alignment Topologically Optimised, and is a new form of arranging microprocessor elements for parallel processing.

Conventional techniques have always been a somewhat two dimensional affair. That is, if you plot the topology of the inter-connections you will see they are arranged in a grid formation with various different patterns of links depending upon the design. A simple design, for example, would take a single processor and attach it to the four surrounding it, above, below, to the left and the right. Another approach adds the diagonals.

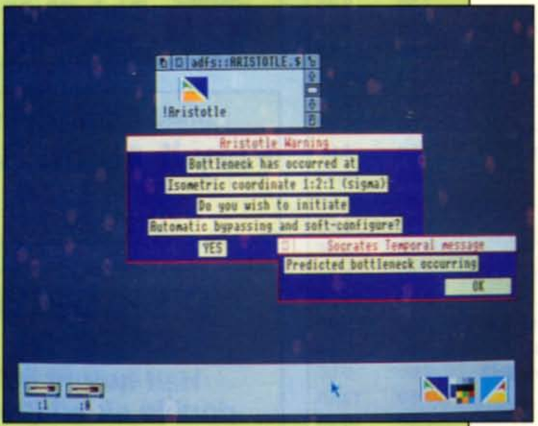
What Plato does is to lift this arrangement out of the plane into higher dimensions. In its simplest form a three dimensional Plato structure would resemble the sort of patterns you get in crystallogrophy, the simplest being a body-centered cubic then a face-centered cubic and so on. Simply think of each atom as a processing element.

You can work on lots of different inter-connection schemes and the beauty of Plato is that they can be dynamically programmed. In other words, the topology is dynamic and can be changed by programming. The physical shape doesn't change of course, simply the way the processors interact with their neighbours. The physical shapes are merely a convenient way for us to visualise them. By programming therefore, the inter-connection network can be optimised – hence the acronym.

All good ideas have to be implemented, and this is where Aristotle comes in. Using a network of Risc chips, Acorn has a three dimensional Plato structure. I don't know how they think of these names because Aristotle is another acronym standing for Acorn Reduced Instruction Set, Topologically Optimised, Through-Line Engine. This contains, initially, 30 Risc chips giving it the staggering capacity of 120 mips with current memory chips and 360 mips flat out, which is well up in the super computer league.

To program this many processor elements Acorn has taken the parallel processing language Occam and extended it, calling it Occam-all. This splits a repetitive task into sections which can be run in parallel. Because of the three dimensional structure, many more operations are susceptible to being made parallel than on a conventional system. A bottleneck in one part of the network does not slow down the whole because, in effect, the program can flow around it.

But it is not so much Aristotle that is amazing as the next logical development. You see, in Plato there is no theoretical limit to the number of dimensions you can topologically optimise. The next step is to go for a hypercube arrangement in four dimensions. The effect of this is that the computing capacity increases to the power of the number of dimensions used. So with two processors per dimension we don't get an eight fold improvement on a single processor but a staggering 16 times.



Bottleneck has occurred at
Isometric coordinate 1:2:1 (sigma)
Do you wish to initiate
Automatic bypassing and soft-configure?

Predicted bottleneck occurring

Output from preliminary versions of Aristotle

This has another quite startling consequence, code named Socrates. As you know, the fourth dimension is time, and theory predicts that a four dimensional processor topology should make inroads into time itself. This is because electricity moves at the speed of light and that, acording to Einstein, makes all the difference.

The reduction in program execution time would be quite staggering. It would be possible, using a four dimensional Plato system, to get the result of a program even before you've had time to type RUN. The acronym itself stands for: Some Over Cautious Readers Already Twig Elaborate Sendup

$E=mc^2$

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A touch of class

John Allen learns how to type right

AT first I thought it was an inspired practical joke when the copy of T-Touch, a typing tutor for the Z88, arrived on my doorstep. After all, I am noted as being the fastest one finger typist in the business. But no, my colleagues at *The Micro User* definitely want me to put that behind me, give up the habits of a lifetime and learn to type properly.

Before finding out whether they were successful, let's look at what you get with T-Touch. There's a 32k rom cartridge, a 30 page manual which is really more of a typing tutorial than a guide to the practically self-explanatory software, a fingering chart to tell you which fingers to place on which keys, a chart to record progress and a make-it-yourself cardboard keyboard cover.

It is always easier to learn to touch type when you have never typed at all, even using one finger. It is probably hardest when, like me, you are an experienced hunt and pecker. Indeed I found another complication, in that it is very difficult to learn properly if you continue doing any other typing incorrectly.

Since I have to type articles and scripts virtually every day and have been doing so for some time it seemed that I was the absolute worst case for learning and, perversely, a good person to try.

Typing is a skill where a lot of muscles have to be coordinated – what psychologists call a sensory-motor skill – rather like riding a bike or driving a car. As with all such skills, a great deal of regular practice is required before it becomes second nature.

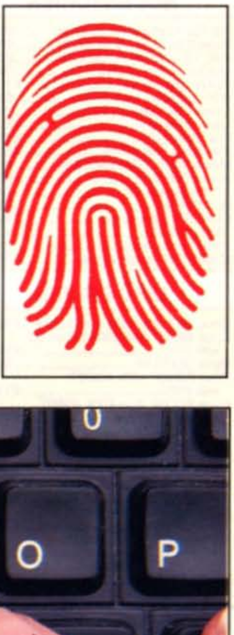
The authors of T-Touch recommend that you set aside an hour every day – or two half hours – over at least a two week period. It is during this time that they recommend no other typing. They also give a suggested plan which can be varied according to individual progress.

The course

Starting point of the course is a thorough understanding of what are known as the home keys – *ASDF* and *JKL;*. These are the ones on which the fingers should be lightly resting when they are not actually typing a letter. T-Touch requires you to type various combinations of these letters, as prompted on the screen, without looking at the keyboard.

Initially I found these exercises extraordinarily difficult because the Z88's keyboard is very

Turn to Page 119 ▶



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sensitive and I never knew when I was getting the pressure right on the key.

Also, while I was concentrating on pressing the correct key, another of my fingers lightly resting on its own would inadvertently press it and I would enter all sorts of unintended extra letters. This is not an unusual problem on any keyboard, but I think it is worse with the Z88.

I have often heard it said that it is easiest to learn on a manual typewriter – indeed some people, many news journalists for example, still prefer a manual keyboard because they make fewer mistakes when typing things in a hurry.

Nevertheless if the intention of learning to type is to be able to use the Z88 then it would seem sensible to learn on that machine. Personally I think it might be easier to learn on my BBC Micro which is a great deal less sensitive. After a few goes at lessons 1 and 2 I did, however, get the knack of the keyboard and thereafter found it much less frustrating.

The course contains 24 exercises and leads you through from the initial practice on the home keys to the QWERTY row, the bottom row and on to special keys such as Shift and Caps Lock. The exercises are well graded and the later ones give copying practice and speed tests. Interestingly none of them cover the top row so there was no help as to which fingers are used for numbers and special symbols.

The intention is that the standard part of the course can be completed in 21 days, achieving a typing speed of 25 words a minute – about the same as normal handwriting.

Conclusions

How did I get on? I am afraid I did not last the three weeks. Initially I found it difficult to cope with the sensitive keyboard and then I found it impossible to give up my normal typing style and set aside the practice time regularly. However it seems an excellently planned course, everyone that I have shown it to has felt that the approach is spot on. So if you want to learn to type on the Z88 I can highly recommend it.

My small rider is that if you do have easy access to a BBC Micro it might be easier to learn on that machine's less sensitive keyboard and then translate to the Z88 afterwards. Taking that route may well avoid frustration – and giving up so readily.

Product: T-Touch
Price: £49.95
Supplier: STS Computer Advice, 8 Anchor Close, Hathern, Loughborough, Leicester LE12 5HP.
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```
)*20+hsn%:IFhs%!i%<s%:hs%!(i%+4)=hs%!i%:
$is%=$(is%-20):I%=I%-1
  800 UNTILI%=0ORhs%!(i%+(I%<>FALSE)*4)>
=s%
  810 hs%!i%=s%:$is%=STRING$(19,".")
  820 ENDPROC
  830 DEFPROCgn:PROCbel(160)
  840 PRINTTAB(8,22)CHR$136"PLEASE ENTER
 YOUR NAME"
  850 T%=0:$&380=$is%
  860 PRINTTAB(4,7+I%)CHR$131;:*FX21
  870 REPEAT:i%=GET:IFi%=13$is%=$&380:UN
TILTRUE:PRINTTAB(4,7+I%)CHR$135:ENDPROC:
ELSEIFi%<32ORi%>127UNTILFALSE
  880 IFT%<19ANDi%<>127VDUi%:T%?&380=i%:
T%=T%+1
  890 IFT%>0ANDi%=127VDU8,46,8:T%=T%-1:I
FT%<>10T%?&380=46
  900 UNTILFALSE
  910 ENDPROC
  920 DEFFNlines:=CHR$146+STRING$(38,CHR
$243)
  930 DEFPROCmode(M%)
  940 VDU22,M%,23;8202;0;0;0;0;19,15,1;0
;19,14,3;0;19,13,4;0;19,12,7;0;19,11,4;0
;19,10,0;0;19,8,0;0;
  950 ENDPROC
  960 DATA138,139,140,140,141,58,32,32,3
2,141,142,143,144,145,58
  970 THEEND
  980 DEFPROCrc:PRINTTAB(0,4)FNlines
  990 a$="........."+CHR$134:b$=CHR$129:
c$=CHR$132
 1000 PRINTTAB(5,6)c$"Z"b$"....."a$"MOVE
 LEFT"
 1010 PRINTTAB(5,8)c$"X"b$"....."a$"MOVE
 RIGHT"
 1020 PRINTTAB(5,10)c$":"b$"....."a$"MOV
E UP"
 1030 PRINTTAB(5,12)c$"/"b$"....."a$"MOV
E DOWN"
 1040 PRINTTAB(5,14)c$"SHIFT"b$"."a$"MOV
E FASTER"
 1050 PRINTTAB(5,16)c$"RETURN"b$a$"FIRE
BALL"
 1060 PRINTTAB(0,18)FNlines
 1070 PRINTTAB(7,20)CHR$136CHR$132"DECOD
ING DATA STRINGS"
 1080 P%=&6000:RESTORE1310
 1090 REPEAT:READS$:PROCrt(S$)
 1100 UNTILP%>&6E79:P%=&900
 1110 REPEAT:READS$:PROCrt(S$)
 1120 UNTILP%>&991:P%=&900:A%=128
 1130 REPEAT:VDU23,A%:A%=A%+1
 1140 FORT%=0TO7:VDUP%?T%:NEXT
 1150 P%=P%+8:UNTILP%>&98F
 1160 FORT%=0TO31:A%=(&3000+T%*&280)
 1170 T%?&900=A%:T%?&920=A%DIV256:NEXT
 1180 hs%=&5F00:$hs%=STRING$(200,CHR$32)
 1190 FORT%=0TO9:READ$(&5E00+T%*20):hs%!
(T%*4)=2000-T%*150:NEXT
 1200 ENDPROC
 1210 DEFPROCrt(S$)
 1220 PRINTTAB(4,22)b$S$
 1230 FORX%=0TO6:A%=0:FORT%=1TO4
 1240 A%=A%+FNdec(MID$(S$,T%+X%*4,1))*64
^(4-T%)
 1250 NEXT:!P%=A%:P%=P%+3:NEXT
 1260 ENDPROC
 1270 DEFFNdec(a$)
 1280 IFa$<":"THEN=VALa$
 1290 IFa$<"["THEN=ASCa$-53
 1300 =ASCa$-59
```

```
1310 DATAAnAnAnAn0nAnAnAk03AnAnA0E0An
1320 DATAAn04J00nAk15NI03A0FKNZE004Ja
1330 DATANaJ015Na0FEW57k2Ak82AnAnA3An
1340 DATAB4An00AnFJEn000nJaJ00004JaJ0
1350 DATA0004FJEnA00nB4AnAkAnAnAn8XAn
1360 DATA0E5U0K1wNU01NU0006000606NU06
1370 DATANU00NZ00NZJJF5E5F5F5AoB5AoAo
1380 DATA030o0303Rr03Rr079287Q0810jwW
1390 DATANaJ3B5NaNZEk0oJaNIA003FKJ300
1400 DATA00B5Ek00000oA000000030000000
1410 DATARk00001r0FEW57k200820005001E
1420 DATA141E0005NaNaM01aNaNaJUNaJaJZ
1430 DATAM6JKNaNa00NaN4NXA00q0000G0A0
1440 DATAzzzE0R1MJ33zFKJKEk03B5NZA000
1450 DATA0oJIEk00B5NZJ300FKJKNIA3JZF5
1460 DATAJZEoNIAoFKJ5J303529KT07y0E8I
1470 DATANr1aNURqNkNU1a1qM6M7Q6M6NaNa
1480 DATANaNaNaNaNaNaM6M7Q6M6NkNU1a1q
1490 DATANr1aNURq0Y90S680NU02NaNaJaNa
1500 DATAJaJJJaJJJaI0JaI0JaI0JaI0JaJJ
1510 DATANaJJNaNa06NaEnFKQ01ZQ0Q7A0Rk
1520 DATA0E520I9m1UM11UM6M606M61U1UNU
1530 DATA1UM6M606M61U1UNU1UM6M606M61U
1540 DATA1UNU1UM6M606M61U529UT07z0E4I
1550 DATA00000000NrRk1rRqB5Nk1qJ3FKNk
1560 DATA1qNIJaNk1qNZFKNk1qNIB5Nk1qJ3
1570 DATARrRk1rRrzVEW57k100420000Q000
1580 DATAF4EkQ0Q3JJJ0Q0Q4JaJ0Q0Q4JJJ0
```

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```
1590 DATAQ0Q4F4EkQ0Q30000Q0Q0RrRrG0Rr
1600 DATA0E60zs1c000100NUM0001UNUNE00
1610 DATAJUJEJ600FKF6EpM6B5ApBrRZQo04
1620 DATA001r0303000007RrVJ00I0040Dm@
1630 DATAQ6I9iL25NEYUQMJlzoZU0KYMRcpU
1640 DATA2?0YSeoM3l0YjE?WLGFrbGFtmWFr
1650 DATACDEE97Qi97Vi97Yi97dirB2897eh
1660 DATA97PBvEOEH2Fqf2FbM2LQU7k4RVCN
1670 DATAr?k0mG0ZFOYY93gU?MEU?ooUmjyW
1680 DATA@0?C@0CC9FgU9DtA?8MU2g3S?8Ml
1690 DATA9@5A?8MUbTydjEd0C0f0XEDdeGHu
1700 DATA4?819DWB9DOCXEedeGHwxe87H2GU
1710 DATAeTzlQ8JMVGmdY?ZleL?5QsIgeHSU
1720 DATAQ97UYE2d48VmAsnpAckf060f0000
1730 DATA00000?Y011mB11Wg2Y2t40nk0?Y7
1740 DATA2Y2NvUDkW0EQMCkEXE6dfGkJw0Eg
1750 DATAM?p8OFU418o6N?o4uHU41Mo50?Y4
1760 DATA100B8@qWo2PU1gs52X0489uWo2PU
1770 DATA1is3zu849i0U3UDEcUE6s22q@R0a
1780 DATAXTudeEE7@8o09?s41?Y49jEU12GB
1790 DATAXN?Z60E610Fh10GBXNCZ60E710Jh
1800 DATA10KB12?i80WdXGPodEEW2cqGPFU4
1810 DATAXEE8dEE82sqHPFU4XEE9eEE98usA
1820 DATAx2048soaYeI410uB36oM38o4YuI4
1830 DATA10yB3KoM3Mo44uY4zzEU10Gg10Kh
1840 DATA802Wf20@fEE8cUE9Wm013?ka30o4
1850 DATA0e849cgU?R0Uc8aWO?o83gY4cUHk
1860 DATA1?2@9YuA9Z?A9XWC9XmCXE?dcWPd
1870 DATAs23z0x0a9iYC8@qWo2PUM?oDPFU4
1880 DATAmGPd0d21o86dbe8I9i0UfF3EC0FU
1890 DATA9ibhg0X92?Y2162B8@SWo2PUN?oC
1900 DATAuHU4hAY2eFSk4x2o89SWo2PUN?oD
1910 DATAOFU4wgY2eE?EN8rkM?o4feU4fEFc
1920 DATAXUFYVGkI89VndGY85cpkQOIg@1SB
1930 DATA@1GiY0vU3e82@@WxjL25VGm05epl
1940 DATAi9og5uogU9og5?sg3i0gfEaEXEFQ
1950 DATAXEFc82kIfGWYVGkK5upkQMIg@1Gi
1960 DATA??FAeTyUx221MCXzr?beYCIseN?5
1970 DATAXK3QXWPxcUEV1@o3Y9I4y13?126h
```

```
1980 DATAeS4k2so0YuIgeEEk0h066DudVN5Z
1990 DATAY?Jn?EUUgE2UJGZkdLK5OFWE2202
2000 DATA0?0d?L2lREKedLK51X2GeEPk0V04
2010 DATA6DudG91ZYOJ80KYMO7C5?EUUgE2U
2020 DATAR8JktbDa86Vnc2Y8Q@40VLE5ROJo
2030 DATA85jkdGVQ3AZldJ?kDG2HYsIdXTyd
2040 DATAnWk1fGk@lEFYD92F1yYsg975Y?Ip
2050 DATAMCosmIc4?f08X06Uf0EVk2Px2B04
2060 DATA12WgH0Dke2VJ@0mtfN?5mGPd0h04
2070 DATAeN868MpzMR0487GZdGVQGYeG?E59
2080 DATAiOU1w01k3AYJdF6k3T2G?HoUeN?5
2090 DATA0Mo12wsg2uogGYcgeH?Eyco5408Y
2100 DATA80?ddGGy1AaEmG2E7@2PmN6Z5d08
2110 DATAo9?Z1OY??IAU0iYsfN?5w0EVe203
2120 DATAYOIfgDb980o4C604I?rs0SY4152B
2130 DATA323Mm?Yf9DeBeF?WjW01uYkY0OYa
2140 DATA12mBcB@EQ8E0c7649Uc49Udko8Vl
2150 DATAfa3r80EMjGW6mEf01R07bE2dmUd0
2160 DATAHCsEjGHyw0d05X0MjIW?VEb0E@pn
2170 DATA2209k@od8?c?O2WYjK2eVGkMC@qm
2180 DATAp8ogG@ocpMog?@ocdOcg1mZkdM25
2190 DATAy2ZkVL25QOKkd@65geK0gM?505qk
2200 DATAg96E@D3?UgP861DEOL2ZQ8I8dP25
2210 DATA06ZlVL65qB2lUGGMdRbEOFWkg8Js
2220 DATAOP6ZgMI2MAfEY?39s?Y5M765V02U
2230 DATAzWZlQGM?QGM?dL251mZnVL05QuJk
2240 DATAGYd?iFWcNEY0Q8Jk2G2tVL5ZGK1l
2250 DATAOFXzXK01c2ZxfFU842a10e8D?Lux
2260 DATA?M1R?LuRx13?TWssTqsdU2sdUKsd
2270 DATAo8UdUOrQTQod1N0d?LrhfDPEM2k?
2280 DATAygE0RfJH2ek0BW0gFOYf?IAUC6YM
2290 DATAaMy5eGlMEm3zXcId@AWNgE2U1z2C
2300 DATA2emMkIkg1?Yd?IAU36YMcb25Q4M4
2310 DATAmYdeaTbE82mEW2gqc08E2ckbfK0g
2320 DATAmGgnBd3j8?2dmGZ30T052eZU9DeB
2330 DATAcUCdjW0H4?YY?nCB862d62Z3XG1d
2340 DATAeGgoEm060FUdBMo8s?Yf?n?B?nDi
2350 DATA?nDi?nChYCz9B8o3QsIf?nGh?EUU
2360 DATAG72ZG76Z?n6hfL25VGgmBOtld20f
2370 DATAXKUcVGgmXKVlVGglBOtkd20fB?oc
2380 DATAOFUfvHU3mEFU3f0E?nChNCosOFU4
2390 DATA1gY?M06EXPGdXGgoeGHu4u839@sU
2400 DATA?nKho0X90OY915lB15mB2QZUfVLE
2410 DATAs0FEpT2NfFXsOEFEI8o1HBU4mGgA
2420 DATA1R0?H12dmGfJ1h0@XTydM2gko0n9
2430 DATAI?oEez04uHXsI8o1HBU4fGgAGEEc
2440 DATA?8o10604y1w6?n1CXESE62gk?n1h
2450 DATA0e0M14lt14mNW02dqDIEiE?U82gh
2460 DATAWDzimDQE?n2B14mt?lYU0w38MDLE
2470 DATA0e18?h?tzysUxl280A1cG0bkGYd?
2480 DATA?21??KUfU0YDzytA7kw0000003z
2490 DATA@AWtiMu5VGlMY@aD0?0gYMtF2emC
2500 DATAca0gY@obEj0g8?W?zWgqjGn892n8
2510 DATA6R21S6YMC0AEbJ3dVGn8K@qC0aYg
2520 DATA@5WRo8y5XcI7@5Wxc8y5Xf40a0Pk
2530 DATA@92RjETkIGmEXd6ChV3?1?ZUc?CW
2540 DATAwIkfzwrzzzzz60md@05h?wyB3V2d
2550 DATA62k1@05h?x6B11Wi2Y2xA3XkE@oq
2560 DATAtHU9OFWE3gY@jGakC0b0697ZmF5d
2570 DATA7@0M2g2xpG18mKUe2T0384W?O2GR
2580 DATA1x2e84W?O2Gd4Aeeua300Cfe0004
2590 DATA9k00zzw0003z0E41uife1ELe4105
2600 DATA4V0E2Uc?2Uc?2UI5M0c?M61U7Vtg
2610 DATA7Vsc?2USxDHk2ed?Bgdeab9IyhOs
2620 DATA@mkW@Goj@Wsi@mwj@mwjs2ogsC3U
2630 DATAsC3UsC3UsC3UsC3UsC3UsC3UsC3U
2640 DATAsC3UsC3UsC3UsC3UsC3UsC3UsC3U
2650 DATAsC3UsC3UsC3U003U000000000000
2660 DATA0000000000000000000000000000
2670 DATA0000000000000000000000000000
2680 DATA0000000000000000000000000000
2690 DATA0000000000000000000000000000
2700 DATA?U00AnAvDlIW4Hgz6X4WAm8l3lcD
2710 DATA3nAnAkw70kQnAnA72kA@3nAnAkw@
2720 DATA9Ewn4HADAWIm000F0000828OAk0W
```

```
 2730 DATA6WIO1nAnAkQ30kgnAnA@9FcZ4E0n
 2740 DATA014E0000M000M61UM61UM61UM61U
 2750 DATAM61U32EkkA0AZNKJkA2J8EA3A30k
 2760 DATAV8G43UkA0kACUM61A30kk9Ik0kD0
 2770 DATA2Id?kA09A32J0n0kUM43V8G1V8G4
 2780 DATAA0kA8H0kM24VBHJUM3Ip92FUEX0Y
 2790 DATAEY92EY92EY92EY92EY92AHA3AH4l
 2800 DATAAH4lAH4lAn4lAkA3D30kDXswD3sy
 2810 DATAA30w0kAnA30nDnkwDnwzA3kw0nAk
 2820 DATAA3A3B3EkB3EoB3EoAn0k4kA34lAH
 2830 DATA4lAH4lAH4lAHEUAHM6d20a1UOY92
 2840 DATAM61UEY9e0mgpCVQL0kAz5ncz?kAL
 2850 DATACXck?nwz0lQ30lQ3Dnwf?ncu?mgf
 2860 DATA0kAf0kA3?mg3?mgf5nck?kAL0kAz
 2870 DATA0mgzCVQL0lQkBHIf0nwkA3w3?nIp
 2880 DATAMVQ3MA1WM61UM61UM61UMa@0AnCF
 2890 DATAAX9WAX8mAX8mAnBWM32FGXAnGYd?
 2900 DATAk0wDAnD0A31UAnAk3w303kg@Aod?
 2910 DATAA30nAq?EMa8nMWQbMa9WMXAnAnCE
 2920 DATAA62FA30kA30kYK0k1nAn0kA@1kQ@
 2930 DATA0kA@1kQ@0kA@0kQ@3kw30kA33kw3
 2940 DATA0kA33kw32kA30kA72kg70kA72kg7
 2950 DATA0kA71kg70kA@1kQ@0kA@1kQ@0kA@
 2960 DATA0kQ@3kw30kA33kw30kA33kw32kA3
 2970 DATA0kA72kg70kA72kg70kA730g710EA
 2980 DATA30k430k4000A100A000A30kA30k8
 2990 DATA20U8AkkA4F4n4HAnAnAF000n000n
 3000 DATA000n8XAn8W8W8W8W3nAW1EID1EI5
 3010 DATA3kw5000D3kwD000D3kwD2Uc?2Uc?
 3020 DATA3kwD2Uc?2Uc?3kc?A30k410EA30E
 3030 DATA430kA200020kA30E820U820UA20U
 3040 DATA0kA30E430k410kA3000300A30kA0
 3050 DATA0U820U820k8253kwD1EID1Ew03kw
 3060 DATA?3k003kwD3k0?2Uw?2UcD3kcA182
 3070 DATA0G0k4UA3k0sEYK9WMXAnAX8mAX8m
 3080 DATAUc9wUc?2401w410kT10EUbk0E3U4
 3090 DATA0Du00c9wUU8w301wF2EI10HyUDs0
 3100 DATA0U@w07m2U40sUc@wzU1w20E2410E
 3110 DATAUbk0Ubm207m2Uc9w109yz01sT492
 3120 DATAz492F3U0Uju208?2U820U820T03y
 3130 DATAT822T882Ubk0U82007m2UYEsF8?2
 3140 DATAz00sz8?2V8WEUDs0UDm00Du0HHzz
 3150 DATARUPERT,BILL,BEN,ANDY PANDY,MUF
FIN,TEDDY,LOOBY LOO,WEED,THE BUMBLIES,Mr
. WOODENTOP
 3160 DEFPROCsh
 3170 ENVELOPE1,1,0,48,0,4,255,4,121,-1,
-1,-1,120,0
 3180 ENVELOPE2,1,0,0,0,8,90,4,90,2,2,2,
90,0
 3190 ENVELOPE3,1,0,0,0,0,0,0,0,0,-1,-1,
127,0
 3200 *TAPE
 3210 PROCrel
 3220 PROCrc:T%=PAGE+1:A$=STRING$(255,"*
"):REPEAT:T%=T%+LEN$T%+1
 3230 IF?T%=255CLS:PRINTTAB(0,10)"LINE 1
760 IS MISSING OR INCORRECT"CHR$7:END
 3240 A$=$(T%+3):REPEAT:IFLEFT$(A$,1)="
"A$=RIGHT$(A$,LEN(A$)-1)
 3250 UNTILLEFT$(A$,1)<>" "
 3260 UNTILLEFT$(A$,6)="THEEND"
 3270 SOUND0,1,6,10
 3280 PRINTTAB(7,20)SPC24TAB(0,22)SPC4"P
RESS SPACE WHEN YOU ARE READY"SPC5
 3290 REPEATPRINTTAB(0,22)CHR$(RND(7)+12
8);:UNTILINKEY-99:*FX13
 3300 ?T%=&FF:*FX3,2
 3310 *FX15
 3320 *FX138,0,203
 3330 *FX138,0,13
 3340 *FX138,0,249
 3350 *FX138,0,13
 3360 END
 3370 DEFPROCrel
 3380 PROCh:IFPAGE=&E00:ENDPROC
 3390 *FX138,0,128
 3400 PRINTTAB(1,10)"PLEASE WAIT WHILE I
 RELOCATE TO &E00"":*FX3,2
 3410 *KEY0FORT%=0TOTOP-PAGE STEP4:T%!&E
00=T%!PAGE:N.|MPAGE=&E00|MOLD|MRUN|M
```

Get it right!

```
  10 =    0 0
  20 =    0 0
  30 =    0 0
  40 =    0 0
  50 =    0 0
  60 =    0 0
  70 = 71CE E
  80 = DC25 7
  90 = 8963 4
 100 = 644C 3
 110 = 817E 7
 120 = BB95 4
 130 = 9BA5 5
 140 = E1CD 9
 150 = 9022 E
 160 = 2467 6
 170 = A61E 2
 180 = 8B74 6
 190 =  9C2 B
 200 = A017 4
 210 = AEA7 7
 220 = CE91 6
 230 = BFE2 F
 240 = B5F5 8
 250 = 16A8 E
 260 = 556B C
 270 = 2EF0 2
 280 = 54EA D
 290 = AD2F E
 300 = 5613 2
 310 = 943F E
 320 = 2A89 C
 330 = D916 E
 340 = D940 8
 350 = ED0F C
 360 = F6B2 1
 370 = 5AC0 E
 380 = 6292 C
 390 = ED0F C
 400 = 7977 2
 410 = 6419 3
 420 = 3568 6
 430 = D5B0 9
 440 = BD50 7
 450 = CEBD 1
 460 = 287B 2
 470 = 2FB1 D
 480 = 92AE 1
 490 = 7D1C F
 500 = 24F1 6
 510 = D983 6
 520 = FB69 A
 530 = 8D7A 1
 540 = A944 6
 550 = 453B 8
 560 = ED0F 4
 570 = 302E 0
 580 = 1963 D
 590 = 2499 0
 600 = F7F7 9
 610 = A8F0 8
 620 = A4CD 9
 630 = 9A28 3
 640 =  589 9
 650 = A825 3
 660 = 62DA 7
 670 = 481A 0
 680 = 4382 6
 690 = ED0F 8
 700 = D9FC 4
 710 = 2B05 C
 720 = ED0F 8
 730 = AFB6 1
 740 = BF05 0
 750 = 52EB E
 760 = ED0F 4
 770 = E433 3
 780 =  395 E
 790 = FE72 5
 800 = C12B 0
 810 = D089 0
 820 = ED0F 3
 830 = 6F9E E
 840 = CE5F F
 850 = CEAD D
 860 = 439D E
 870 = AFFB 2
 880 = 19A6 9
 890 = CB50 6
 900 = E014 0
 910 = ED0F 5
 920 = 4759 3
 930 = 78B9 F
 940 = 145E 0
 950 = ED0F 3
 960 =  2E7 3
 970 = 6777 E
 980 = 2611 E
 990 = 956E 8
1000 = 7D98 4
1010 = 358D 5
1020 = 5404 6
1030 = A017 6
1040 = 7C6B 1
1050 = F1A8 5
1060 = E09F 0
1070 = F6A2 0
1080 =   83 4
1090 = FEBF C
1100 = 661F 9
1110 = FEBF D
1120 = E2FB 6
1130 = 13B9 D
1140 = D149 C
1150 = 3A22 8
1160 = BE6E 2
1170 = 6475 A
1180 = A856 B
1190 = 1565 1
1200 = ED0F 0
1210 = BFDC 3
1220 = 746A 6
1230 = 7277 A
1240 = 8456 A
1250 = 1DE2 D
1260 = ED0F 0
1270 = 9C56 E
1280 = FCE4 C
1290 = 683B 4
1300 = 62DD 7
1310 = 51D2 1
1320 = 364F 8
1330 = EB46 F
1340 = 9912 3
1350 = E076 B
1360 = 82C6 5
1370 = 5477 D
1380 = 852D 4
1390 =  25A 8
1400 = 22C7 8
1410 = EBE1 D
1420 = B379 6
1430 = B32E 9
1440 = F8B8 5
1450 = 8071 6
1460 = 3D20 9
1470 = 3D02 3
1480 = 39B3 A
1490 = 1161 C
1500 = ED67 7
1510 = 49AF 2
1520 = 385E 9
1530 = 3DC8 0
1540 = 1CC9 1
1550 = 3A63 7
1560 = CC39 0
1570 = F856 3
1580 =  74C 0
1590 = 137D 0
1600 = 7C6D E
1610 = E67E 9
1620 = 8CF6 D
1630 = 3F7F 5
1640 = 9850 C
1650 = DE42 8
1660 = 72AD B
1670 = B61F 7
1680 = F055 C
1690 = 6071 B
1700 = 460F 7
1710 = E215 6
1720 = B226 B
1730 = 7B6A 3
1740 = 8BE8 6
1750 = 1590 1
1760 = D696 C
1770 = 8843 D
1780 = C9B6 6
1790 =  C2D 0
1800 = 45B1 C
1810 = BF8B B
1820 = 2FD8 A
1830 = 2645 3
1840 = E14B 1
1850 = 188A 5
1860 =  48A D
1870 = E893 1
1880 = 3B36 B
1890 = 8F3D 5
1900 = E771 1
1910 = 55B1 B
1920 = 415B A
1930 = B3CC F
1940 = 4FB2 3
1950 = 7DCC D
1960 = 815C 5
1970 = 45AA E
1980 = 2079 8
1990 =   CF 0
2000 = C25B 4
2010 = 5C66 2
2020 = 563E 5
2030 = C9EB 7
2040 = 9611 4
2050 = 8123 4
2060 = E357 2
2070 = C886 A
2080 = A35D A
2090 = 7B95 B
2100 = 326A F
2110 = 92C0 E
2120 = 56BA A
2130 = 990B 3
2140 = 4E92 F
2150 = 7049 B
2160 = 6C26 C
2170 = 102B C
2180 = 9254 1
2190 =  928 9
2200 = 2569 E
2210 = 8517 D
2220 = 3FCE 0
2230 = C6A0 1
2240 = CA6B 5
2250 = 8D64 5
2260 = 7E79 3
2270 = A79C 5
2280 = 2CB9 3
2290 = E9D9 6
2300 = 7292 9
2310 = 8771 D
2320 = 505B 1
2330 = 82C0 2
2340 = B09C B
2350 = FDD6 E
2360 = 8401 8
2370 = F402 0
2380 = 35FF 1
2390 = 8A94 D
2400 =  B16 2
2410 = 320E 7
2420 = A370 4
2430 = 6A15 E
2440 = F140 4
2450 = D083 3
2460 = 677A 1
2470 = 1A2E 9
2480 = 3202 2
2490 = DE1A 9
2500 = 7028 5
2510 = EB98 0
2520 = D5F6 B
2530 = 56B9 A
2540 = 501D 6
2550 = 4542 D
2560 = B6FF 5
2570 = 6E9E B
2580 = 4F7C F
2590 = D6CB 4
2600 = E771 8
2610 =  D34 C
2620 =  A30 A
2630 = 4DAE C
2640 = 4DAE 8
2650 = 9D8D C
2660 = 8E34 8
2670 = 8E34 D
2680 = 8E34 A
2690 = 8E34 9
2700 = 575A F
2710 = 7EF8 8
2720 = 2EFB 7
2730 = E3DC 5
2740 = 600C 1
2750 = 773E C
2760 = 770A F
2770 =  E20 C
2780 = 34E8 5
2790 = 5EAD 3
2800 = F507 9
2810 = DB98 8
2820 = DF58 C
2830 = 4E1E 4
2840 = C141 1
2850 = 7D91 1
2860 = B9B2 9
2870 = A652 A
2880 = 9813 A
2890 = ABFE 3
2900 = C4DF C
2910 = 74F0 4
2920 = DC12 C
2930 = BFBE A
2940 = 66A2 6
2950 = 2F4D E
2960 = 85CC 6
2970 = A5C8 9
2980 = E47F 5
2990 = 71E5 6
3000 = D180 3
3010 = 7992 C
3020 = C7AE B
3030 = 5192 4
3040 = 6BE1 A
3050 = A40F 3
3060 = 2C0E F
3070 = 51F0 3
3080 = 1925 8
3090 = C4C3 2
3100 = 9069 D
3110 = 35D3 4
3120 = 15C5 F
3130 = 6579 E
3140 = A201 E
3150 = 9A54 D
3160 = AC13 6
3170 = CEF7 1
3180 = 350A E
3190 = 9B06 2
3200 = CD93 D
3210 = 9DB8 A
3220 = 53F8 6
3230 = EBAC A
3240 = 64B2 8
3250 = C5E4 7
3260 = 85C6 0
3270 = 44A8 8
3280 = BD3D 5
3290 = C326 D
3300 = F811 6
3310 = A022 B
3320 = D3B5 6
3330 = 42B1 5
3340 = BE3B A
3350 = 42B1 B
3360 = FD2E 1
3370 = 8B20 C
3380 = BCC5 3
3390 = 5DEC 8
3400 = 33BF 5
3410 = 834F 9
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MICRO USER CLASSIFIEDS

- BBC B, Forth, AMX mouse, Superart, Joysticks, cassette software, speech synthesis, books and magazines £250 ono. Tel: 0945 65230 evenings.
- BBC B wordprocessing system, View and Printmaster roms, twin 40/80T disk drive, monitor £375. Tel: 0524 761665 (Cumbria) after 6pm.
- BBC B dual 40T disc drive, ATPL sideways rom board, Watford 32K shadow ram, Interword, Interchart, Intersheet, Wordwise, Printmaster, Graphics, PMS font £300 ono. Taxan Supervision 2 £175. Tel: 0703 849065.
- BBC B issue 4, Solidisk DDFS, 128SWR £225. Dual DS80T drives PSU £130. Colour monitor £60. MT80 printer £60. Offers? Tel: (01) 659 4373.
- BBC B issue 7, Cumana 40/80T drive, Acorn teletext adaptor, Solidisk 128K board, Interword roms, magazines, £340 ono. Tel: (0247) 457490 after 6pm.
- Master 128 £335, Cumana Combo CCD2000S 3.5"/5.25" £225 ono. Turbo board £79 ono as new. Tel: Bedford (0234) 856050.
- Cumana 40T 100K drive with power supply £50. Tel: Bradford 0274 600652.
- Immaculate BBC B+64K with manuals, books, leads, games, utilities (on rom). Genuine reason for sale, (Archie!) sensible offers. Tel: Sameer (0634) 65600.
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- BBC B 40T Disc drive, manuals £115 software price £195. Tel: Alex (01) 958 7535 (evenings).
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- Master Compact colour with 3½" and 5¼" disc drive plus accessories £400. Tel: 0985 214676, After 5pm.
- Viglen 40/80 Track DS Drive + various manuals £75. Watford Electronics speech processor with manual and rom chip, £25. Phone: Deeside 813943, after 4pm.
- Opus Challenger D.S D.D, single drive +256k ram disc, manual V.G.C £90. Tel: 0732 810492.
- BBC B, disc drive, discs, roms, sidewise rom board, games, books etc, £280 ono. Tel: 0908 663985.
- BBC B Issue 7 O.S 1.2, Acorn DFS with software £225. Tel: Sunbury 788322.
- Master 128 Philips mono monitor, Cumana 800s 40/80DD cassette player. Prestel modem with Viewstore, and Prestel roms, all manuals 30 discs £450. Tel: 0491 571338.
- Meta Assembler package £60, Wordwise plus £20, Communicator £15, Forth £15. All original roms with full information manuals £40 ono. Phone: 051 256 9814.
- BBC B+128k + DFS, Disc Doctor, wordwise +, Basic editor, Opus dual D/S 40/80 drives, CP/M80+ printer, Microvitec colour monitor, manuals £570, will split. Congleton (0260) 278594.
- Epson FX-800 printer, excellent condition hardly used £175 ono. Z80 second processor includes software plus Wordstar professional. Offers Tel: 0525 375179 evening 0908 693179 daytime.
- Solidisk 32k ram £15, software from 50p. Tel: 0232 799071.
- Acorn Z80 second processor plus software, £150. Tom: 01-769 0012.
- BBC "B" issue 7 40T 100k drive. 1770 DFS, double joysticks, datacorder, Vufile/Vucalc, 100+ games, loads "a" mags. All user guides, discs etc., covers. Worth £950, bargain at £400. Tel: 0732 364339.
- Nightingale modem and Commstar 2, or Microvitec colour medium resolution monitor, or Centronics GLP printer and Dumpout 3, £60 each or £150 all three. 01-449 6146 after 6pm, Jonathan Gwyer.
- Archimedes 310M disc colour monitor, unwanted prize still boxed £950. Tel: 01-699 7061.
- BBC B monitor, CSX 100, printer, datacorder, romboard, Replay, loadsa games, mags etc. £475 ono. Tel: 061 761 3534.
- Model B data recorder software, games £145 ono. Tel: 01-441 1019.
- Acorns GXR rom £12. Vine micros matrix rom £20. Permanent Memory Systems NTQ rom with two extension font roms £40. ATPL rom board with battery backup and ram chips, £35. Beebug Romit £15. 0925 811420, evenings.
- Acorn 512k processor board with latest version Dos+ (V2.1), manual, mouse, Gem etc. Digital research Dos+ users guide, Mastering Dos+ Simon Williams £70. Phone: 0787 71842.
- BBC B OS1.20 colour monitor, 40T D/S 16k disc ram, tape disc rom, tape recorder, Wordwise+ manuals, £100. Games, stand £500 ono. Tel: 0602 395036.
- BBC B dual 40/80 switchable drives, S/W ram, Philips colour TV monitor, Taxan printer, Music 500, 230+ discs, 15 roms, will split. Offers please 051 6484419 Steve.
- Acorn 6502 second processor with Hibasic, Basic editor, Beebug Romit, CC speech and TTS roms. All with manuals only £75. Tel: Bracknell (0344) 55772 evenings.
- BBC B Viglen case and PSU disc (100k), external rom socket, Acorn 1770 DFS, speech, Oxford Pascal, Toolkit+, replay and many original games discs. Only £270. Tel: Bracknell (0344) 55772 evenings.
- Wanted back issues Micro User magazines. 10/86, 9/85, 5/85, 4/85, 8/84, 4/83 £4 per magazine, plus postage. Graham Badcock, 45 James Street, Kellerberrin, 6410 Western Australia.
- BBC B 52k PC Console, dual 80/40 disc drives, Zenith Hi-res green monitor, Aries B12 rom board, B20 shadow ram, View, Viewsheet, Viewstore Viewspell roms, all manuals £500. Tel: Cambridge 244046.
- Wanted Teletext adaptor with optional power supply. Tel: 0222 611156 (evenings).
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- Archimedes 310M colour, with MS-Dos, Pipedream, game, printer lead and desktop stand, £1,000. 01-390 2407.
- Wanted a copy of Century computer programming course for BBC Micro by Morse and Hancock. Mr T Lock, 14 St Matthews Rd, Cosham, Portsmouth, Hants.
- Z80 second processor for sale with all books, CP/M, P Basic BBC Basic, Memoplan etc, etc £120 ono. Phone: Phil on (0245) 324607.
- Screenprint rom prints virtually any screen, manual £15 complete. 0255 222392.

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- BBC B Issue seven Cumana single Disc-Drive, dot-matrix, printer Morley teletext receiver, colour T.V as monitor, View, other roms, 50+ discs manuals books + magazines £500, or will split. Phone: (Blackpool) (0253) 33954.
- Master 128, Watford CLS400S drive, + loads more, £370. Ring for details: 0760 721348.
- BBC B Basic model with Acorn datacorder adapted for Econet, £185 ono. Tel: 091 454 5380 evenings.
- Cumana 40T disc drive with PSU £50. BBC Prestel adapter, rom, £50. Tel: Chandlers Ford (0703) 252614.
- Roms: Interword £25, AMX pagemaker £25, Max £10, Advance Disc Investigator £18, Peartree Artist £10, Extra, Extra £10, books £1 each. 0532 661412.
- Electron, Plus I, Plus II, PMS-E2P, View/sheet, T2P3, recorder, mint, £230. 0793 641309.
- BBC B, issue 7, Solidisk DDFS, 40/80T DS Drive, disc doctor + extras, £295. Tel: (0482) 801018.
- Solidisk 20Meg Winchester+ controller chip, £350. Opus twin 40T disk drive with PSU £100. GraphPad £30 Solidisk DFS, £15. Prism modem + chip £30. tape games. All offers considered. Brian 08832 6211.
- BBC B+ DFS OS1.2 complete with excellent very high resolution Sanyo 14" colour monitor (knocks spots off most mono displays), and 5¼" disc drive, retail value £1,150 my price £400, might consider splitting. Buy before end of March and get a 160CPS printer for £100. Tel: 0256 468334.
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- BBC B disc drive, printer, tape, plus LOADS MORE! Tel: 01-524 3121, Simeon Herbert. After 4pm.
- BBC B OS1.2, dual 40/80 disk drives with PSU, high resolution colour monitor, printer, joystick, Wordwise, Masterfile, games. Bargain £475 ono. 01-458 3170.
- Immaculate Beeb OS1.2 DFS £200. 400k DS 40/80T drive £70. ISO Pascal £40. Wordwise £20. Pineapple's Diagram 2 £40. Games including Elite Strykers, Firetrack £15. Utilities £10. Blank discs, printer cable, all manuals and boxes. The lot for £375. Tel: 01-381 1467 Tony.
- BBC Master 128 Spellmaster, Genie installed, Cumana double sided 40/80 switchable disc drive. Software includes Office Master, printer driver and all manuals, £500. Margaret Turpin (0672) 54444.
- BBC B Micro comp, Vi-tec cub colour monitor, Technomatic 40/80 track D/D twin disk drive, Z-80 second processor, user guide and welcome software (cassette), £800 ono. Phone: 01-690 9933.
- Diablo 630 daisy wheel printer, serial interface, 40CPS, 132 Column tractor feed, BBC micro cable, manual and some spares, superb print quality, VGC scarcely used and Pericom data terminal with 14" green screen. Total £250. (07374) 2013 evenings (Surrey).
- Joystick, Captain Grant model £7.00. Fleet Street Editor £30. Commstar £15.00, serial printer cable £5.00, cassette cable 7-pin M/M £3.00, diskette notcher kit, £7.00. All items new/unused including postage. John West 0233-83571.
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- Cambridge Z88 expandable 32k, mains adaptor, soft case, book, parallel lead. boxed communicates with PCs, BBC, Sinclair, through available links (not supplied), £160. Call Hatfield 07072-76974, eves.
- Star LC10 printer 6 months old, sensible offers. Telephone: 0342 810 843. evenings.
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Available for BBC B/Master/Compact.

SCHOOL-BASED INSET PACK –WORD PROCESSING
This pack aims to develop or extend teachers' word processing skills for use in the school curriculum. The pack can be used by an individual teacher or by a tutor with a group of teachers and includes assignments, help cards, case studies, examples of children's work and a tutor book. Although based on FOLIO, the ideas demonstrated in the pack can be used with any WP package.

THE ENTERPRISE PUBLISHING KIT
This kit aimed at 13 to 19 year olds can be used to set-up and run any publication with ease. The activity is student-centred and encourages enterprising behaviour in students. It is a powerful vehicle for the development of personal and social skills, and results in a product which is clearly identifiable as educational. Any DTP software can be used alongside the material and the entire activity is underlaid with guidance on profiling.

WHAT'S IT TO YOU?
This is a content-free program with applications across the whole humanities curriculum. The program allows teachers to create situations for pupils to explore, where attitudes and opinions will affect individuals decisions. The program could be used, for example, to stimulate pupils' thinking about stereotyping, or multicultural and gender issues.
Available for BBC B/Master/Compact, RM Nimbus and Archimedes

Further details from:

NORTHERN MICROMEDIA
Resources Centre, Coach Lane Campus, Coach Lane, Newcastle upon Tyne
Tel: 091 270 0424

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would overlap existing ones or silly line step sizes. The routine will not move lines, although it could be modified to do this with an attendant time penalty.

PROCSAVE(filename,first line,last line): Saves the specified group of lines in the current Basic program to the given name as a completely independent program without disturbing the resident one.

PROCSYSTEM: Displays the values of some of the more commonly altered FX values – printer destination and flash rate, for example. It also gives information about the Basic program status in a more easily readable form than the normal HELP command does.

```
   10 REM > Bas_Utils
   20 REM by Terry Blunt
   30 REM (c) The Micro User
   40 MODE MODE
   50 PRINT'"INSTALL""Bas_Utils"" - then"
   60 PROCHELP:END
   70 :
   80 DEF PROCHELP
   90 PRINT'SPC3"Command - (syntax)"
  100 PRINT'" PROCHELP"
  110 PRINT'" PROCMERGE(filename)"
  120 PRINT'" PROCNUMBER(new first line,
old first line,old last line,step size)"
  130 PRINT'" PROCSAVE(filename,first li
ne,last line)"
  140 PRINT'" PROCSYSTEM":ENDPROC
  150 :
  160 DEF PROCMERGE(f$)
  170 IF TOP-PAGE=2 PRINT'"No program to
 merge into":ENDPROC
  180 !(HIMEM-16)=OPENIN f$
  190 IF !(HIMEM-16)=0 PRINT'"No file to
 merge":ENDPROC
  200 LOMEM=HIMEM-&1000:DIM buf% 255
  210 file%=!(HIMEM-16)
  220 point%=PAGE:top%=TOP
  230 REPEAT:VDU46
  240 PROCUload_line(buf%,file%)
  250 num%=FNUget_line(buf%)
  260 point%=FNUfind_line(num%)
  270 IF FNUget_line(point%)=num% PROCUa
djust_line(buf%,point%,top%) ELSE PROCUi
nsert_line(buf%,point%,top%)
  280 UNTIL PTR#file%>EXT#file%-3
  290 CLOSE#file%:*FX 138 0 79
  300 OSCLI"FX 138 0 46":*FX 138 0 13
  310 END
  320 :
  330 DEF PROCNUMBER(new%,fst%,lst%,stp%
)
  340 LOCAL num%,point%,swap%
  350 IF FNUinvalid(new%,fst%,lst%,stp%)
 ENDPROC
  360 IF FNUget_line(PAGE)<fst%:IF FNUch
eck_start(PAGE) ENDPROC
  370 IF FNUfind_line(lst%)<TOP-2:IF FNU
check_end ENDPROC
  380 point%=PAGE
  390 WHILE point%<TOP-2
  400 PROCUscan_line(point%)
  410 PROCUinc_line(point%)
  420 ENDWHILE
  430 swap%=new%
  440 point%=FNUfind_line(fst%)
  450 num%=FNUget_line(point%)
  460 WHILE num%<=lst%
  470 PROCUput_line(point%,swap%)
  480 PROCUinc_line(point%)
  490 num%=FNUget_line(point%)
  500 swap%=swap%+stp%
  510 ENDWHILE
  520 ENDPROC
  530 :
  540 DEF PROCSAVE(f$,fst%,lst%)
  550 LOCAL a%,f%,start%,end%
  560 start%=FNUfind_line(fst%)
  570 end%=FNUfind_line(lst%)
  580 IF FNUinvalid(0,fst%,lst%,1) ENDPR
OC
  590 IF FNUget_line(end%)=lst% PROCUinc
_line(end%)
  600 f%=OPENOUT f$
  610 FOR i%=start% TO end%
  620 BPUT#f%,?i%:NEXT
  630 BPUT#f%,255:CLOSE#f%
  640 OSCLI"SETTYPE "+f$+" FFB"
  650 ENDPROC
  660 :
  670 DEF PROCSYSTEM:PRINT
  680 SYS"OS_Byte",236,,255 TO ,!(HIMEM-
16)
  690 PRINT "*FX 3 ";!(HIMEM-16);
  700 SYS"OS_Byte",237,,255 TO ,!(HIMEM-
16)
  710 PRINTTAB(20)"*FX 4 ";!(HIMEM-16);
  720 SYS"OS_Byte",245,,255 TO ,!(HIMEM-
16)
  730 PRINTTAB(40)"*FX 5 ";!(HIMEM-16);
  740 SYS"OS_Byte",246,,255 TO ,!(HIMEM-
16)
  750 PRINTTAB(60)"*FX 6 ";!(HIMEM-16);
  760 SYS"OS_Byte",195,,255 TO ,!(HIMEM-
16)
  770 PRINT'"*FX 9 ";!(HIMEM-16);
  780 SYS"OS_Byte",194,,255 TO ,!(HIMEM-
16)
  790 PRINTTAB(20)"*FX10 ";!(HIMEM-16);
  800 SYS"OS_Byte",196,,255 TO ,!(HIMEM-
16)
  810 PRINTTAB(40)"*FX11 ";!(HIMEM-16);
  820 SYS"OS_Byte",197,,255 TO ,!(HIMEM-
16)
  830 PRINTTAB(60)"*FX12 ";!(HIMEM-16)
  840 !(HIMEM-16)=M%:DIM M%-1
  850 PRINT'"PAGE    = &";~PAGE TAB(20)"T
OP     = &";~TOP TAB(40)"LOMEM  = &";~LOM
EM TAB(60)"VARTOP = &";~M%
  860 M%=!(HIMEM-16)
  870 SYS"OS_Byte",135 TO ,,!(HIMEM-16)
  880 PRINT "HIMEM  = &";~HIMEM TAB(20)"
FREE   = &";~HIMEM-!&8674 TAB(40)"@%
 = &"~@% TAB(60)"MODE   = ";!(HIMEM-16)
  890 ENDPROC
  900 :
  910 DEF FNUinvalid(new%,fst%,lst%,stp%
)
  920 LOCAL t$:CASE TRUE OF
  930 WHEN TOP-PAGE=2 : t$="No program t
o renumber"
  940 WHENfst%<0:t$="Silly first number"
  950 WHENlst%<0:t$="Silly last number"
  960 WHENnew%<0:t$="Silly new start"
  970 WHENfst%>lst%:t$="Last line less t
han first"
  980 WHEN stp%<1 OR stp%>255:t$="Silly
step size"
  990 ENDCASE
 1000 IF t$>"" PRINT't$
 1010 =t$>""
 1020 :
 1030 DEF FNUcheck_start(p%):LOCAL a%,b%
 1040 WHILE b%<fst%:a%=p%
 1050 PROCUinc_line(p%)
 1060 b%=FNUget_line(p%)
 1070 ENDWHILE
 1080 IF FNUget_line(a%)>=new% PRINT'"Ne
w first line too low"
 1090 =FNUget_line(a%)>=new%
 1100 :
 1110 DEF FNUcheck_end
 1120 LOCAL a%,b%,p%:a%=new%-stp%
 1130 p%=FNUfind_line(fst%)
 1140 b%=FNUget_line(p%)
 1150 WHILE b%<=lst%
 1160 PROCUinc_line(p%)
 1170 b%=FNUget_line(p%)
 1180 a%+=stp%
 1190 ENDWHILE
 1200 IF a%>=b% PRINT'"New last line too
 high"
 1210 =a%>=b%
 1220 :
 1230 DEF PROCUscan_line(p%)
 1240 LOCAL byte%,end%:byte%=p%+4
 1250 end%=p%+p%?3
 1260 WHILE byte%<end%
 1270 CASE ?byte% OF
 1280 WHEN 34 : PROCUstring
 1290 WHEN 141 : PROCUcheck_goto
 1300 WHEN 220 : byte%=end%
 1310 WHEN 244 : byte%=end%
 1320 OTHERWISE byte%+=1
 1330 ENDCASE
 1340 ENDWHILE
 1350 ENDPROC
 1360 :
 1370 DEF PROCUcheck_goto
 1380 LOCAL num%:byte%+=1
 1390 num%=FNUget_goto(byte%)
 1400 IF num%>=fst% AND num%<=lst% PROCU
change(num%,byte%)
 1410 byte%+=3:ENDPROC
 1420 :
 1430 DEF PROCUchange(n%,p%)
 1440 LOCAL a%,b%,c%:c%=new%
 1450 a%=FNUfind_line(fst%)
 1460 b%=FNUget_line(a%)
 1470 WHILE b%<n%
 1480 PROCUinc_line(a%)
 1490 b%=FNUget_line(a%)
 1500 c%+=stp%
 1510 ENDWHILE
 1520 PROCUput_goto(p%,c%):ENDPROC
 1530 :
 1540 DEF FNUfind_line(a%)
 1550 LOCAL b%,p%:p%=PAGE
 1560 b%=FNUget_line(p%)
 1570 WHILE b%<a%
 1580 PROCUinc_line(p%)
 1590 b%=FNUget_line(p%)
 1600 ENDWHILE
```

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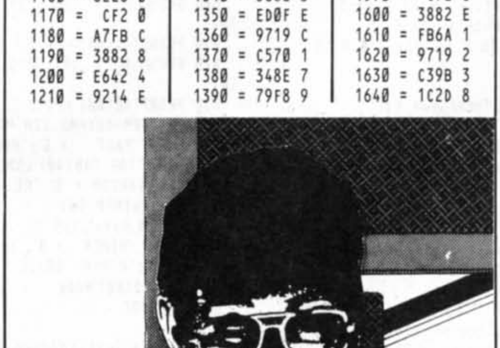
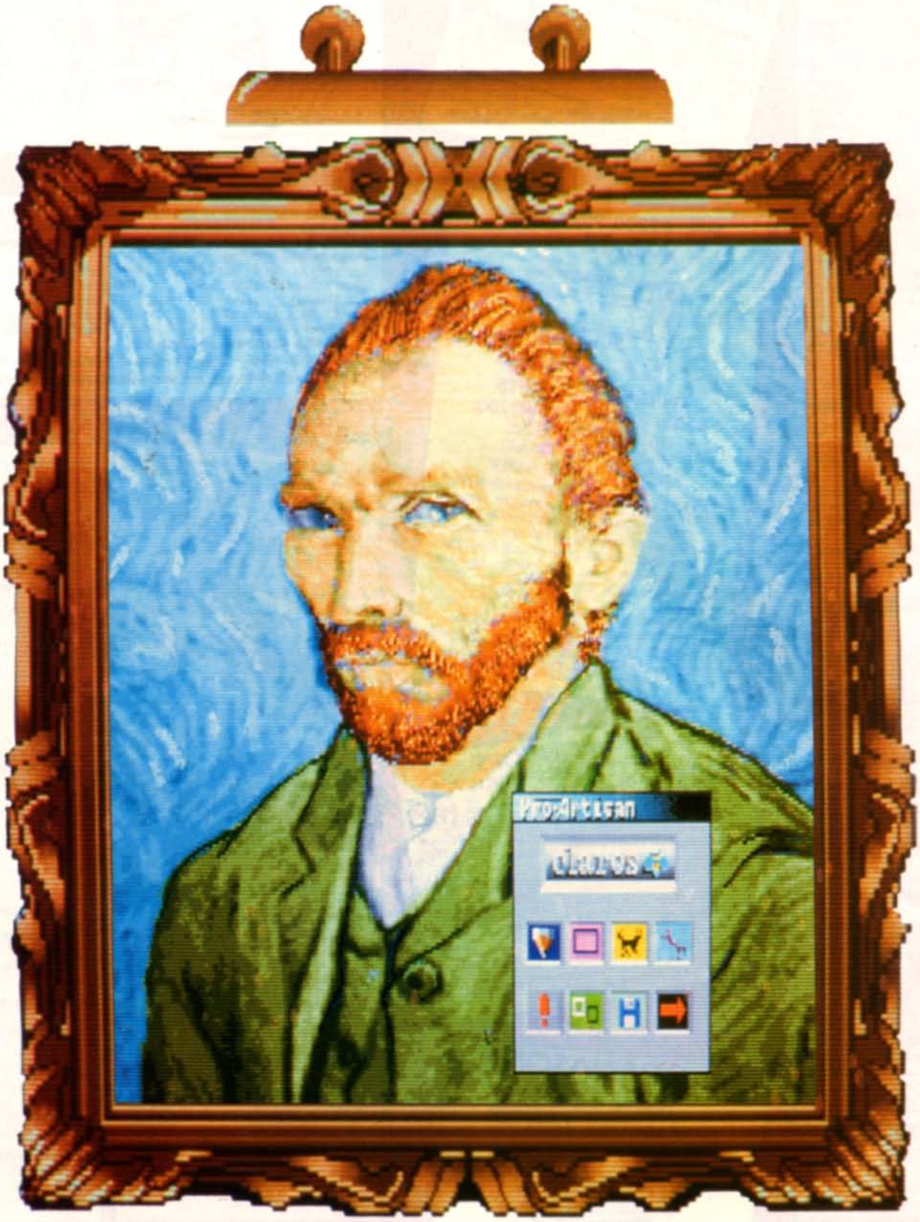
```
 1610 =p%
 1620 :
 1630 DEF PROCUinc_line(RETURN p%)
 1640 p%+=p%?3:ENDPROC
 1650 :
 1660 DEF FNUget_line(p%)=p%?1*256+p%?2
 1670 :
 1680 DEF PROCUput_line(p%,n%)
 1690 p%?1=n%DIV256:p%?2=n%AND255
 1700 ENDPROC
 1710 :
 1720 DEF PROCUload_line(p%,f%)
 1730 LOCAL a%,i%:?p%=BGET#f%
 1740 IF ?p%<>13 PRINT"Merge failed at
line ";FNUget_line(point%):CLOSE#f%:END
 1750 p%?1=BGET#f%
 1760 IF p%?1=255 p%?3=2:ENDPROC
 1770 p%?2=BGET#f%:p%?3=BGET#f%
 1780 a%=p%?3-1:FOR i%=4 TO a%
 1790 p%?i%=BGET#f%:NEXT:ENDPROC
 1800 :
 1810 DEF PROCUadjust_line(b%,p%,RETURN
t%)
 1820 LOCAL a%,c%,d%,i%:a%=b%?3
 1830 c%=t%+4-(t%-p%)MOD 4
 1840 IF a%<p%?3 PROCUmove_down ELSE IF
a%>p%?3 PROCUmove_up
 1850 FOR i%=0 TO a%-1:p%?i%=b%?i%:NEXT
 1860 ENDPROC
 1870 :
 1880 DEF PROCUinsert_line(b%,p%,RETURN
t%)
 1890 LOCAL a%,c%,i%:a%=b%?3
 1900 c%=t%+4-(t%-p%)MOD 4:t%=t%+a%
 1910 FOR i%=c% TO p% STEP-4
 1920 i%!a%=!i%:NEXT
 1930 FOR i%=0 TO a%-1
 1940 p%?i%=b%?i%:NEXT:ENDPROC
 1950 :
 1960 DEF PROCUmove_down
 1970 d%=p%?3-a%:t%-=d%
 1980 FOR i%=p% TO c% STEP 4
 1990 !i%=i%!d%:NEXT:ENDPROC
 2000 :
 2010 DEF PROCUmove_up
 2020 d%=a%-p%?3:t%+=d%
 2030 FOR i%=c% TO p% STEP-4
 2040 i%!d%=!i%:NEXT:ENDPROC
 2050 :
 2060 DEF FNUget_goto(p%)=(?p% AND 48)*4
 EOR p%?1+((?p% AND 12)*16 EOR p%?2)*256
 2070 :
 2080 DEF PROCUput_goto(p%,n%)
 2090 p%?1=(n% AND 63)OR64
 2100 p%?2=((n% DIV 256)AND 63)OR64
 2110 ?p%=((((n% AND 255)EOR p%?1)DIV 4)
AND 48)OR((((n% DIV 256)EOR p%?2)DIV 16)
AND 12)
 2120 ENDPROC
 2130 :
 2140 DEF PROCUstring:REPEAT byte%+=1
 2150 UNTIL byte%?-1=34 OR byte%=end%
 2160 ENDPROC
```

Get it right!

```
  10 =    0 0
  20 =    0 0
  30 =    0 0
  40 = 1A63 3
  50 = B12B 6
  60 = 7206 2
  70 = 9719 0
  80 = EAEF F
  90 = 96C1 E
 100 = DC3F 9
 110 = 610B C
 120 = AF9F 8
 130 = 407B F
 140 =  835 6
 150 = 9719 A
 160 = 5B4C 5
 170 = D206 D
 180 = C894 1
 190 = 10AF D
 200 = D95C C
 210 = C7C7 5
 220 = 63C2 2
 230 = 4B87 E
 240 = 5E1A B
 250 = 8E1D D
 260 = 4E25 9
 270 = 128D 8
 280 = 6B60 A
 290 = 7583 D
 300 = 2D7C 6
 310 = FD2E F
 320 = 9719 3
 330 = F28B E
 340 = A594 2
 350 = 87CF 9
 360 = 5031 9
 370 = 86B9 D
 380 = 5DB3 E
 390 = 6DA8 7
 400 = 98C6 5
 410 = E849 1
 420 = 3882 8
 430 =  FB3 2
 440 = B663 F
 450 = 75A8 C
 460 = 9160 F
 470 = 4E26 E
 480 = E849 F
 490 = 75A8 3
 500 = 9129 E
 510 = 3882 7
 520 = ED0F F

 530 = 9719 1
 540 = 2937 B
 550 = B2E4 8
 560 = 1095 A
 570 = 21FB 1
 580 = EEE4 0
 590 = 3E11 3
 600 = 4222 C
 610 = 6AC5 C
 620 =  6E0 5
 630 = BACB F
 640 = D700 5
 650 = ED0F C
 660 = 9719 8
 670 = 208E 4
 680 = 8820 E
 690 = EAD2 9
 700 = 98C2 7
 710 = 2F5D A
 720 = 49D3 9
 730 = 9182 4
 740 = 78F5 9
 750 = FF7B 5
 760 = CA2A 9
 770 =  745 A
 780 = DAC8 4
 790 = 715E B
 800 = FB0C 2
 810 = CF81 3
 820 = EBEE 2
 830 = 442E 7
 840 = 7378 7
 850 = 4143 5
 860 = FA09 4
 870 = 65A2 9
 880 = 488E 5
 890 = ED0F 8
 900 = 9719 8
 910 = 147A 0
 920 = C20D D
 930 = F5AB 1
 940 = 9AA1 B
 950 = A9D1 6
 960 = DEE0 C
 970 = B1BE 3
 980 = B338 2
 990 = 6827 2
1000 = D827 D
1010 = B2F0 9
1020 = 9719 9
1030 = 6A59 0
1040 = CA51 8

1050 = 62E6 A
1060 =  CF2 1
1070 = 3882 B
1080 = 5A8A 3
1090 = EF5C 0
1100 = 9719 4
1110 = B7B7 3
1120 = 41A0 4
1130 = AA69 4
1140 =  CF2 7
1150 = 4189 E
1160 = 62E6 0
1170 =  CF2 0
1180 = A7FB C
1190 = 3882 8
1200 = E642 4
1210 = 9214 E

1220 = 9719 B
1230 = 8027 D
1240 = AAD4 9
1250 =  CC5 1
1260 = 735E 3
1270 = 3695 8
1280 = 2E88 6
1290 = ADEA 8
1300 =  67B 6
1310 = 2DB5 C
1320 = 524E E
1330 = 6827 1
1340 = 3882 3
1350 = ED0F E
1360 = 9719 C
1370 = C570 1
1380 = 348E 7
1390 = 79F8 9

1400 = 10F2 2
1410 = 95CF 7
1420 = 9719 3
1430 = B244 1
1440 = F2A9 F
1450 = F489 F
1460 = 78A1 8
1470 = FFD4 3
1480 = 16B5 0
1490 = 78A1 8
1500 = 285D F
1510 = 3882 6
1520 = B702 B
1530 = 9719 4
1540 = 1256 5
1550 = E610 A
1560 =  CF2 1
1570 = EFEA B
1580 = 62E6 A
1590 =  CF2 8
1600 = 3882 E
1610 = FB6A 1
1620 = 9719 2
1630 = C39B 3
1640 = 1C2D 8

1650 = 9719 D
1660 = 1E77 2
1670 = 9719 6
1680 = 14D9 F
1690 = 6156 C
1700 = ED0F 6
1710 = 9719 2
1720 = 1A86 A
1730 = 465A B
1740 = 22CA 8
1750 = A838 4
1760 = E32E 1
1770 = B8E0 1
1780 = D6F5 C
1790 = 2D42 4
1800 = 9719 3
1810 = F80A 7
1820 = 49CB B
1830 = 3375 A
1840 = EA7E 8
1850 = A7A2 9
1860 = ED0F 1
1870 = 9719 0
1880 = 4423 D
1890 = E7E5 5
1900 = D6F1 E
1910 = 7C33 8
1920 = 3C94 6
1930 = 64D1 2
1940 = F661 A
1950 = 9719 A
1960 = E9A2 2
1970 = 1198 0
1980 = F3CC 3
1990 = C973 F
2000 = 9719 8
2010 = D640 B
2020 =  E66 3
2030 = 7C33 1
2040 = 46E4 8
2050 = 9719 6
2060 = B9B4 C
2070 = 9719 E
2080 = 9008 6
2090 = 5585 B
2100 =  F42 3
2110 = EB7B 2
2120 = ED0F 0
2130 = 9719 B
2140 = A96B 3
2150 = 12A2 1
2160 = ED0F 9
```



WORK OF ART BY VAN GOGH.



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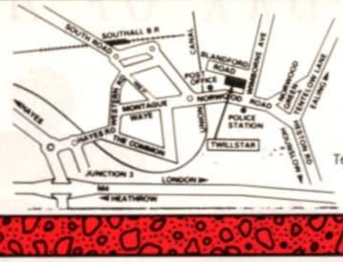

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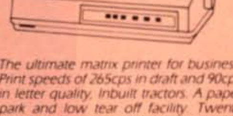

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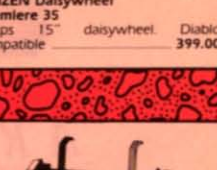

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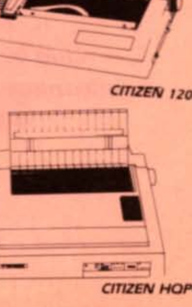


CITIZEN HQP40

PRINTERS

£10 Prize letter

Accumulator variables used in recursion

RECURSION as described in your January 1989 issue is a fascinating, and often useful, technique but it is not without the occasional drawback. Consider the familiar recursive definition for the Fibonacci series:

```
 10 DEF FNfib(N%):IF N%
<=1 THEN =1 ELSE =FNfib
(N%-1)+FNfib(N%-2)
```

*This works but it is woefully slow – with fib(20) it takes more than a minute. A little investigation shows that it makes 2*fib(N%)-1 calls to the function – a number which soon becomes impossibly large. A better way is to use an accumulator variable, as in the following example:*

```
 10 DEFFNfib(N%,acc%,la
st%):IF N%=0 THEN =acc%
 ELSE=FNfib(N%-1,acc%+l
ast%,acc%
```

Call it with FNfib(X,1,0) – or FNfib(X,0,1) if you prefer fib(0) to be 0. Using integer variables in this function – and probably the previous one, if you have enough patience – will produce negative results for some values of N%>45, showing that there is no range checking on integer arithmetic. As the following will prove if you enter it as a direct command:

```
FOR I%=2147483640 TO 21
47483647:PRINT I%:NEXT
```

Watch what happens when I% reaches the end of the loop (=&FFFFFFF) – it is incremented to &80000000. Since this has the sign bit set it is taken as a negative number, -2147483648, which is obviously less than the finish value. Approximately two years later – but quicker on an Archimedes – the whole sequence repeats.

Finally, if the first line of a Basic program is entered in the same format as one on the Archimedes:

```
10REM > filename
```

then

```
SAVE $(PAGE+8)
```

will save it under that filename. This could be entered on one of the function keys. – **Phil Bender, Sunderland.**

Airing your ribbons

THE feature on reviving printer ribbons in your December 1988 issue deserves further comment. Anyone contemplating this rather messy procedure should ask why the ribbon is not printing well.

If it has had little use but has been exposed to the air for a long time, then it may be worth the effort. However, if it has been in constant use, it's not worth it.

The fabric of the ribbon will be worn and close examination may show the development of small holes – especially if you buy same type *ribbons which are not your printer brand.*

I had considerable trouble with a Kaga printer, where a worn ribbon caused the pins of the head to catch and stop its travel. I diagnosed a worn head, only to find after buying a new one, that the inferior ribbon quality was the cause.

These cheaper ribbons were sold by a well-known company as Kaga ones but were not, in fact, from Kaga. So beware cheap ribbons.

The problem of ribbons drying out is further influenced by the amount exposed to the atmosphere. I have several printers in use with one having no more than one inch of ribbon exposed and another with almost 30 inches open to the air.

Needless to say the latter dries rather quickly and the suggested technique might be beneficial here. If the ribbon is not worn – try it. If it is it's probably not worth the effort. – **P.J. Whyer, Woburn Town, Bucks.**

Win a tenner

● Want to write to The Micro User? The address is: Letters, The Micro User, Europa House, Adlington Park, Adlington, Macclesfield SK10 4NP.

Writers of the most interesting letters receive a £10 prize.

Backups easier

CAN you or one of your readers please help me with what I imagine is a simple bit of programming? When I'm word processing I always have two discs installed in my double drive, but if I want to save to both it means saving, changing drives and saving again.

A little program to do this automatically from the first save command would be very useful. Any offers? – **Ron Shavreen, Hallow, Worcs.**

● You can eliminate the changing drives problem by incorporating the drive number into the filename which can take the form:

```
:drive.directory.file
```

So to load FRED from directory X on drive 1 use:

```
:1.X.FRED
```

You can improve upon this by programming a function key with the two save commands set up – then you'd only have to hit one key to do it.

Another way to safeguard your files is to use the automatic Archiver from our August 1988 issue. This keeps a copy of your file in directory B when you save another copy so you always have the last two generations of your work.

Hiding catalogues

WHEN I tried cataloguing the free disc on the December issue of The Micro User *all I got was the words* Impact Demo. *Could you please tell me how this is done.* – **M. Curtis, Ramsgate, Kent.**

● As we've said on many occasions, there are lots of ways of protecting software.

Hiding the catalogue and putting a message on the screen requires a disc sector editor to put control characters into the title and filenames. Here is a method to get you started, and one or two ideas for you to experiment with. First, put a title on your disc by entering:

```
*TITLE "PRIVATE**"
```

Use a sector editor to change

Turn to Page 130 ▶

◀ From Page 129

the second *, which can be found near the start of track 0 sector 1, to 21 – &15 – which switches off the VDU drivers.

When you catalogue the disc now you'll just get PRIVATE* on the screen – but if someone enters Control+B before issuing a *CAT the catalogue will print successfully.

Using the editor, put &02 in place of the first * which is near the start of track 0 sector 0 to stop this.

If you put a dummy file on your disc to appear at the end of the catalogue – say called ZZZZZZZ – you can replace the last character with &06 to switch the VDU drives back on.

Finally, how can you put a long message – or even a dummy catalogue – on a disc? You don't switch the VDU drivers off in the title, but use a sector editor to put things like the delete character or cursor movement into the names of dummy files.

You must, however, note that although some disc systems will load files with control characters in their names, not all will. So even if your DFS will load such files, only use control characters in dummy ones or you will find the system fails on other machines.

£10 Prize letter

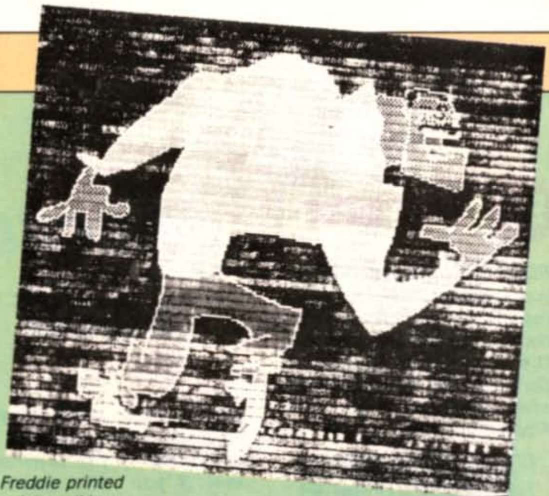
Carbon copy is the answer

THE new inks article in the December 1988 issue of The Micro User *gave me an interesting idea how I could produce excellent prints without using any ink.*

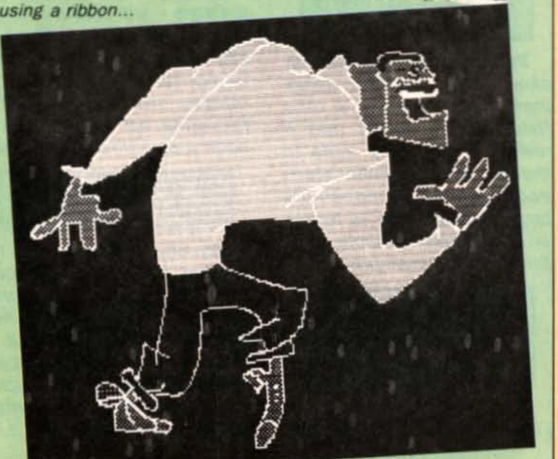
All you need is a sheet of carbon paper and two sheets of normal printer paper. Place the carbon paper between the two sheets with the matt or ink side downwards and carefully feed it into the printer, ensuring the papers are the correct way around.

When the graphics sample or text is dumped to the printer an excellent copy is produced – a comparison between the ribbon and carbon methods is shown. – **Stuart Monger, Billericay, Essex.**

● The carbon method certainly gives improved output, and using coloured carbon paper and the routines from our December 1988 issue, you can easily do coloured dumps.



Freddie printed using a ribbon...



...and using carbon paper

Removing errors

I WOULD like to find a way of resetting the ERR and ERL values to zero in order to detect and therefore report an error within a standard exit routine only when an error has occurred in a particular program.

It is apparent that these system variables are carried forward from one program to the next and are not reset by a LOAD or CHAIN command.

Do you have an elegant routine up your sleeve for handling this? I would have no problem if I were allowed to use GOTO statements, but the young generation of programmers believe in discouraging this disgusting habit. – **Colin M Johnson, Lympne, Hythe, Kent.**

● As old errors will have no effect on new programs and new ones only affect the current program when it generates one itself, we can't see why you would want to do this.

However although we can't think of an elegant way here's a routine which sets ERR to 1 and ERL to 0:

```
 0 IF N%=1234:!&100=&10
0:CALL&100
 1 ON ERROR IF N%=1234
N%=0:GOTO5 ELSE N%=1234
:GOTO0
 4 ERROR
 5 ON ERROR OFF
 6 REPORT:PRINT ERR,ERL
```

Monitor progress

AFTER reading the article A monitor for most micros, *in your January 1989 issue, I hastened away to Watford Electronics to see one demonstrated with an Archimedes, and subsequently bought one. I presently have access to a Master, but in the future hope to obtain an Archimedes. I can't get the monitor to operate with the Master and have come to the conclusion that I may be attempting the impossible.*

Do you have a solution and is the last paragraph of the article – BBC Micro compatibility – correct? – **L.E. House, West Drayton, Middx.**

● The Eizo monitor is suitable for a Master as we stated. However, when you switch it to TTL inputs it reconfigures the input connection.

The secret is to leave the monitor switched to analogue inputs – this will do no harm, as it simply drives the inputs into saturation.

Note, however, the Eizo monitor has a short persistence phosphor so when it's used with a BBC B or Master you get flicker-free displays only with the interlacing switched off.

ALL programs printed in this magazine are exact reproduction of listings taken from running programs which have been thoroughly tested.

However, on the rare occasions when mistakes occur corrections are published as a matter of urgency. Should you encounter error messages when you type in a program, they will almost certainly be the result of your own typing mistakes.

Unfortunately we can no longer answer personal programming queries concerning these mistakes. Of course letters about suggested errors will be investigated without delay, but any replies found necessary will only appear in the letters pages.

Cracking the code

I HAVE just bought a copy of Exile and on the back of the novella is a picture of the Runes. I found the Code Catcher program in the July 1988 issue of The Micro User *an ideal way to decode it.* – **Jim Burdus, Waitakaruru, New Zealand.**

Chaining Basic in rom

ONE of the most interesting programs that I have seen published about the use of sideways ram – from the point of view of a Basic programmer – was Prommer by Hugh Haskell from the June 1987 issue of The Micro User.

The unique feature it offered was the ability to incorporate Basic programs as well as machine code into sideways ram. In the situation of one Basic program calling another the article stated that the only change required was the replacement of:

```
CHAIN"name"
```

by

```
*NAME
```

When I tried this with a set of three related programs the effect was that the Master 128 just hung up although the new program had been loaded into main memory from sideways ram. This could be seen by pressing Break and entering OLD.

*I eventually found a method of achieving the required result by use of the *FX138 command to effect a function key press after first loading *name into the key. The replacement for CHAIN"name" is:*

```
OSCLI"KEY0*NAME|M":OSCL
I"FX138,0,128":END
```

The first part of the command puts name into function key 0 and the second inserts Ascii 128 into the keyboard buffer – equivalent to pressing function key 0.

*The final command – END – terminates the running of the current program and puts into effect the *FX138 command to load and run the program name.* – **Lance L. J. Vick, Department of Physics, University of Edinburgh.**

Classic poser

I was recently presented with a schoolboy problem:

```
  ALPHABET
+  LETTERS
= SCRAMBLE
```

The letters represent the numbers 0 to 9 – two of them represent the same number – and I need to find what all the letters represent.

Apart from noting that A, L and S can't be 0, I could not get very far. So I programmed my Master to solve the problem by testing combinations of letters.

After realising that I would need to leave the micro running overnight, I calculated that it would need about a year to complete the work of offering the letters every possible combination of numbers.

Have any of your readers an answer to this problem or – even better – a general solution to this type of puzzle? – **Geoffrey Shalet, Harrow Weald, Middx.**

● We're sure that one of our readers will be able to solve this one – we'll publish the best program we receive as a £10 letter.

The Quest continues

*IN the Letters pages in your January 1989 issue Peter Walton of Norway asks you about using the Screen Converter program (*The Micro User *February 1988) to convert screens to use with Watford's Quest Paint. I feel that your answer may be missing the point, as I have suffered from the same problem myself.*

As you say, Quest uses a slightly different area of memory when loading and saving a screen and if you attempt to load in – through the Mode 7 menu – a normally saved one you get a distorted result.

The vertical splitting, the apparent swapping of the two halves and any garbage at the bottom of the screen is due to Quest attempting to load the screen to the location it expects a Quest-saved screen to start – &2BFC.

There is, however, a simple solution. When saving the screen from the Convert utility – or from Basic – use the following method:

```
*SAVE SCREEN 3000 +50
00 2C00 2C00
```

then, from the Quest Mode 7 menu, type:

```
*LOAD SCREEN
```

Wait for the prompt to appear, then click on the right hand button twice. This returns you to the Mode 1 graphics screen and you should find your picture in its correct place. You may, however, find that you will have to adjust the colours. I believe this is due to Quest using &2BFC to &2BFF to store the actual colours.

I hope that this answers Peter's question and helps anyone else in a similar position. – **David Sheperdson, Ikley, Yorks.**

Problem PAGEs

WHEN I try to type in a program after resetting PAGE the cursor returns to the beginning of the next line and remains there. No prompt appears or, if AUTO has been used, no line number is displayed and the only way out is to press Break.

Occasionally I can type in a program but when I try to list it I get a Bad program. – **A.P. Davis, Helensburgh, Strathclyde.**

● After you change PAGE you must then type NEW, even if you have no program in the machine. This resets all Basic's pointers to reflect your new position of PAGE.

£10 Prize letter

Roomier Archimedes

EVEN with all the extra memory available, it is still possible to get the dreaded No Room *error in a Basic program on an Archimedes – I did it. To protect your programs from this enter a line:*

```
DIM M%-1:IF HIMEM-M%<20
00 PRINT"Workspace limi
ted"
```

This line should be called frequently if the program uses a lot of complex string handling, or recursion. The DIM, magically takes up no space itself and, by trial and error, I've found that you need between 1,000 and 2,000 bytes headroom to allow for procedure and parameter stacks.

Following is – yet another – short Basic program to totally compact a disc in the currently selected drive. It relies entirely on the proper ADFS calls now available:

```
   10 REM > $.LIBRARY.A
llcom
   20:
   30 DIM work% 2
   40 SYS "ADFS_Drives"
 TO drive%
   50 $work%=STR$drive%
   60 REPEAT
   70 *COMPACT
   80 SYS "ADFS_FreeSpa
ce",work% TO total%,gre
atest%
   90 UNTIL total%=grea
test%
  100 PRINT "Compacted"
```

*With the routine saved in your library directory, simply type *allcom to use it.*

A point that is not made clear in the user guide is that incore filenames in Basic programs can use a full file specification like the above. I always use this now, as it is annoying to find that you've saved a program into the wrong directory and, later on, can't find it.

Finally a reminder about the omission in ADFS–DiscOp for those brave enough to use it. When using an alternative disc record the byte at offset 34 must be set to the drive number. – **Terry Blunt, Crowthorne, Berks.**

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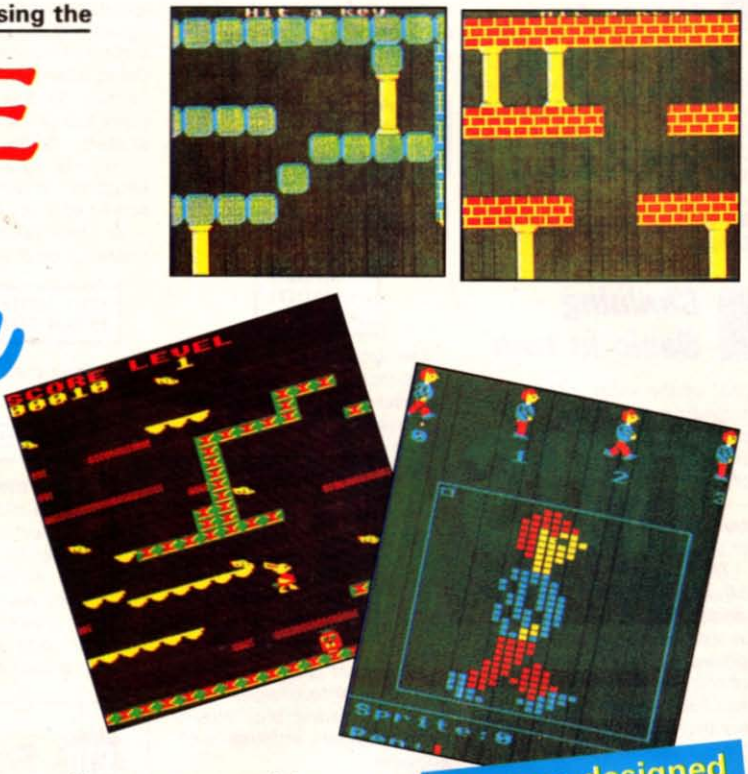

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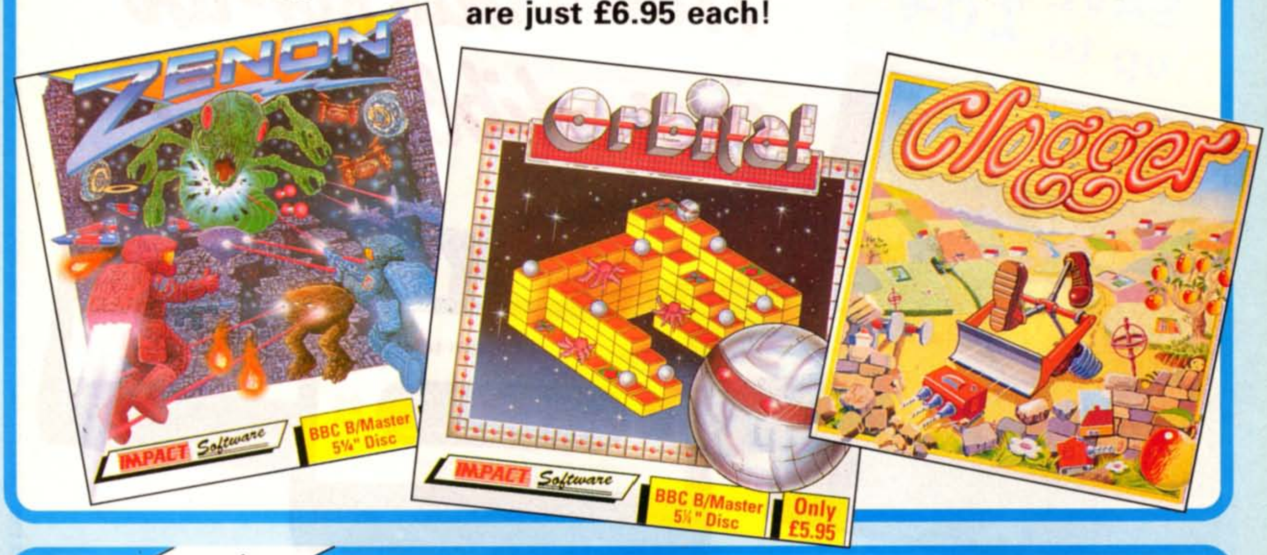

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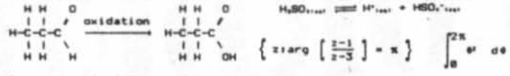

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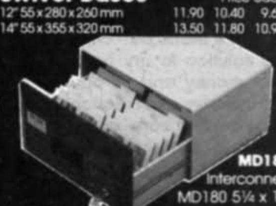

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